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Surgery, Gynecology and Obstetrics

WITH

International Abstract of Surgery

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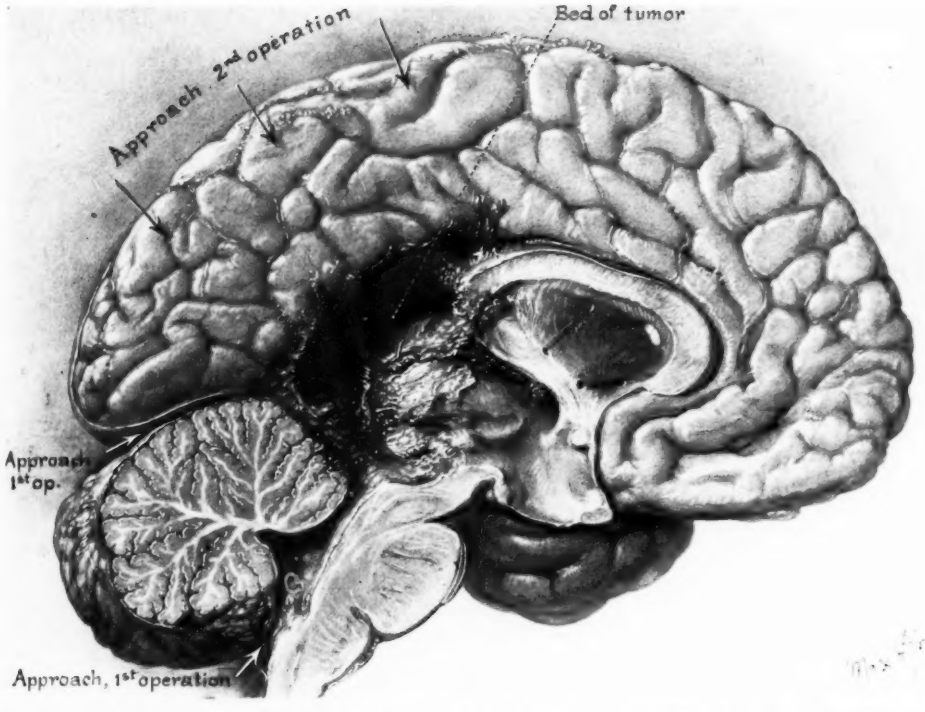

Fig. 10. Drawing of mid-sagittal view of brain from which a pineal tumor was removed. The bed from which the tumor was removed shows its location and relative size. The tumor was exposed first by following up the fourth ventricle. It was then exposed by an approach over the cerebellum and under the tentorium but the removal was seen to be possible only by operative procedure just described.

An Operation for the Removal of Pineal Tumors.—Walter E. Dandy.

SURGERY, GYNECOLOGY AND OBSTETRICS

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AN OPERATION FOR THE REMOVAL OF PINEAL TUMORS

BY WALTER E. DANDY, M.D., BALTIMORE
From the Department of Surgery, The Johns Hopkins Hospital and University

TUMORS of the pineal body have rarely been diagnosed and substantiated. The total number of authenticated pineal tumors is less than one hundred and almost all have been accidental findings at necropsy. In most instances the clinical diagnosis of a pineal neoplasm has been made upon inadequate and fallacious observations and deductions and a totally different lesion has been found at necropsy. But it is now possible to make a correct diagnosis of this lesion; at times the exact diagnosis cannot be made but the lesion can be restricted to the mesencephalon with the pineal growth the highest probability. Naturally the absence of a correct localization of this lesion has precluded any operative interference with this region, and with the advent of accurate localization, the need of a practical surgical approach for the enucleation of pineal tumors is imperative. It is the purpose of this paper to introduce such an operative procedure. The diagnosis of tumors of the pineal body will be withheld for a subsequent communication.

Several years ago I evolved an operative procedure by which it was possible to remove the pineal body in dogs.[1] The operation as finally developed could be conducted without mortality and without any noticeable after-effect upon the well-being of the animal and resulted in no apparent mental or physical change. The operation which is presented here for patients suffering with pineal tumors is very similar to this canine operation.

The operation has been performed on three patients. In the first instance a silent cerebellar tumor had secondarily involved the region of the pineal body and the corpora quadrigemina; after exposure of the tumor, no attempt was made to remove it, because of its infiltrating character. This case, however, showed that a good exposure of this region is possible. On two subsequent occasions, tumors of the pineal body have been completely removed. In one case an encapsulated tubercle of the pineal body was extirpated, the patient recovering only to die 8 months later, presumably of the effects of other tubercles of the brain, although as he was then at home no necropsy was obtained. After the removal of the tubercle, however, the signs by which his lesion was located quickly disappeared. The gross appearance of this growth at the time of operation suggested an endothelioma and it was only subsequently that the microscope revealed its true nature to be a tubercle. It was hard, nodular, and perfectly encapsulated; it measured 5 centimeters by 4 centimeters. The results of thisc ase demonstrated not only the feasibility of the removal of tumors of the pineal body but also the absence (in this case at least) of any injurious mental or physical effects due to the operation.

[1] Extirpation of the pineal body. J. Exper. Med., 1915, xxii, 237.

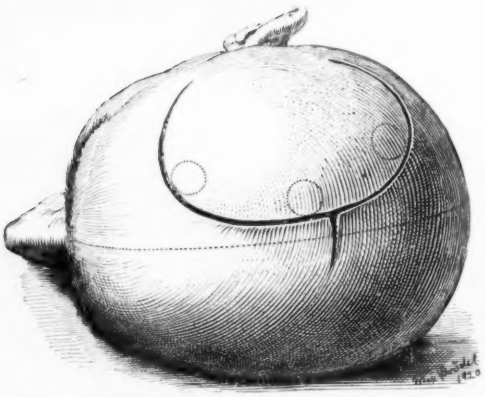

Fig. 1. The skin incision and the openings for the bone flap are outlined permitting a thorough exposure of the posterior two-thirds of the cerebral hemisphere. The incision extends almost to the mid-line and is made large enough to permit exposure of the posterior two-thirds of the cerebral hemisphere.

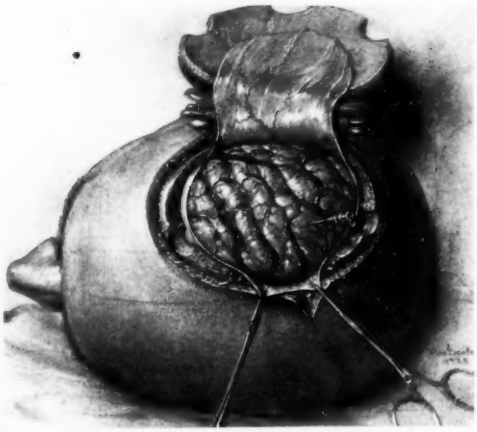

Fig. 2. The bone flap is turned back and the cerebral hemisphere exposed mesially to the superior longitudinal sinus. A puncture of the lateral ventricle reduces the intracerebral pressure and consequently the volume of brain in the field of operation.

The extirpation of the second pineal tumor was very much more difficult. The tumor was much larger and since the vena Galena magna and both small veins of Galen passed directly through the tumor and could not be dissected from it, the removal of practically all of these veins was a prerequisite to enucleation of the tumor. This tumor weighed 26 grams. It was very hard, fairly nodular, and perfectly encapsulated. It required a painstaking dissection to free the growth from the extensive vascular attachments, but it was finally readily lifted from its bed without any bleeding. The patient lived 48 hours, dying presumably of the shock due to the magnitude of the operation. His vitality was doubtless impaired by a cerebellar operation which was performed 10 days previously and at which the tumor was found; but it was entirely inaccessible for removal by this approach. One can, of course, only wonder whether there might have been a different outcome had his full strength been retained. One must also consider whether the complete removal of all the main trunks of the intracranial venous system—the large vein of Galen and both small veins of Galen—would be compatible with life. I know of no previous instance in which these veins have been removed or even ligated. In dogs I have ligated the vena Galena magna without effect when the ligation is distally placed but when proximally placed a mild grade of hydrocephalus has resulted. In this case, however, at least 7 centimeters of this vascular trunk on either side were removed. Whether the collateral venous system in the human brain could be developed to compensate for this tremendous loss can only be surmised; it does seem doubt-

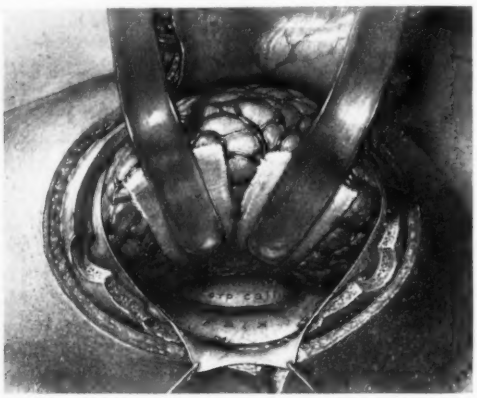

Fig. 3. The cerebral hemisphere is retracted exposing the corpus callosum and the falx. Note the ligated stumps of the cerebral veins as they enter the superior longitudinal sinus.

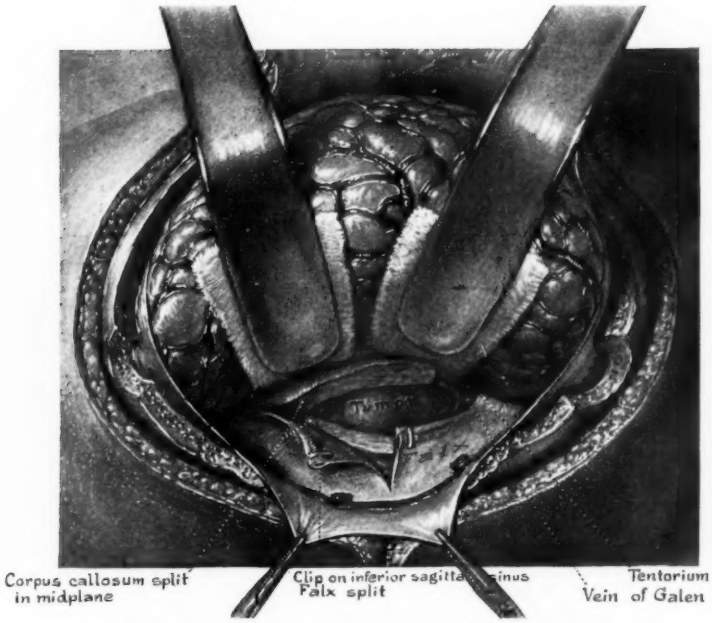

Fig. 4. The corpus callosum has been divided longitudinally exposing the tumor of the pineal body and the entire length of the vena Galena magna and the terminus of each small vein of Galen. Note the divided falx and inferior longitudinal sinus.

ful, but there was no alternative to the removal of these veins with the tumor.

THE TREATMENT OF PINEAL TUMORS

Tumors of the pineal body can be helped by only one form of therapy, i.e., operative removal. Any treatment which is less than this can have no possible value. The symptoms which bring the patient to the physician are invariably those of intracranial pressure due to an internal hydrocephalus which is caused by occlusion of the aqueduct of Sylvius directly over which the tumor is situated. Other signs of local character follow the direct pressure of the tumor upon the corpora quadrigemina and upon the structures in the mesencephalon. There can be no relief of the hydrocephalus except by removal of the obstructing lesion. No palliative benefits can possibly accrue from a decompression or from the too oft performed puncture of the corpus callosum. A decompression removes an area of bone which is nature's only protection against the tremendous intraventricular pressure and local cerebral injury must follow at the operative area and without any possible compensatory benefit to the afflicted individual. A callosal puncture admits of no relief because the fluid released absorbs with no greater rapidity in the subdural space, into which it passes, than in its former habitat in the ventricle; moreover, the opening remains patent only for a brief period, closing as all non-epithelialized cerebral wounds must do owing to the reparative processes of the neuroglia.

The operation, therefore, which I am about to propose is designed to remove the tumor directly. The accompanying drawing and diagram by Mr. Brœdel clearly show the various stages in the operation. The approach to the tumor is made possible by a very large parieto-occipital bone flap (Fig. 1), the mesial margin of which extends to the superior

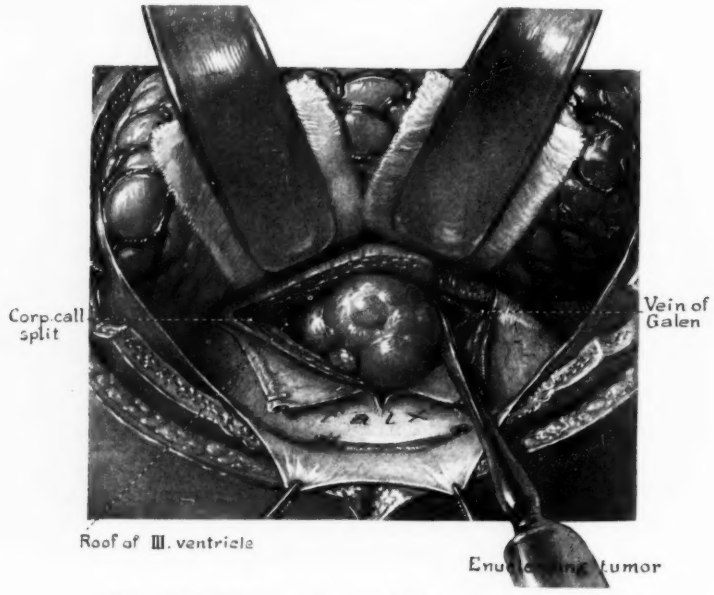

Fig. 5. Demonstrates the enucleation of the encapsulated pineal tumor. This particular growth was a tubercle of the pineal.

longitudinal sinus. The exposure of this sinus (Fig. 2) is frequently a relatively bloody procedure because of the venous lakes, which

Fig. 6. After removal of the tumor the roof of the third ventricle in this case remained intact and the large vein and the two small veins of Galen are brought into view. The large vein is quite tortous; the two small veins unduly separated by the growth between them.

are usually both large and numerous and the control of hæmorrhage must be quick and effective. If the bone flap does not extend to the mid-line a secondary defect must be rongeured away from the mesial margin of bone until the sinus is reached. The dura is then opened and reflected over the inferior longitudinal sinus. In doing so, the cerebral veins which bridge the subdural space between the brain and the longitudinal sinus are gradually elevated, doubly ligated with fine silk ligatures, and divided (Fig. 2). The number of these veins in the necessary field of operation varies from one to six or even more. It is well if possible to avoid ligature of the Rolandic vein for a transient hemiplegia will follow. Usually, however, it is necessary to ligate all the veins posterior to the Rolandic vein. It is hardly necessary to add that for this reason and because of possible speech disturbances, the craniotomy should be performed on the right side; and because tumors of the pineal body are always in a strictly central position, exposure of the growth is equally easy on either side. In the case in which the

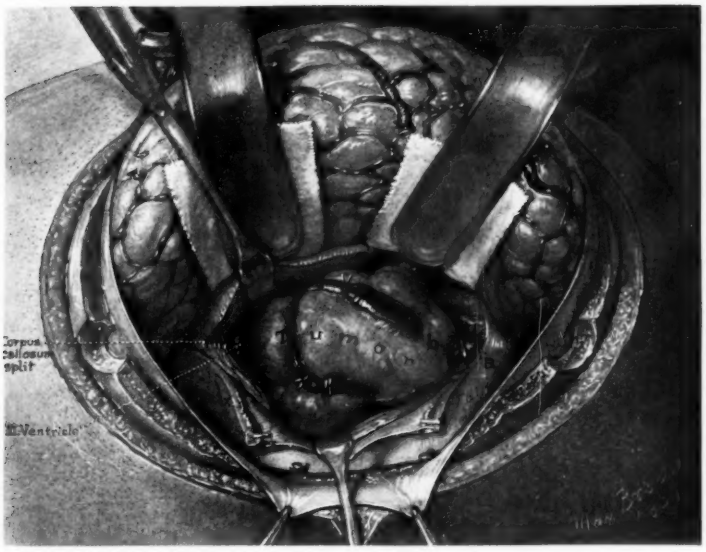

Fig. 7. Drawing of the large pineal tumor in position when thoroughly exposed and just before its enucleation. Note the ligatures on the large vein of Galen and on each small vein of Galen. The veins pass directly through the tumor. The growth has pushed the third ventricle well forward.

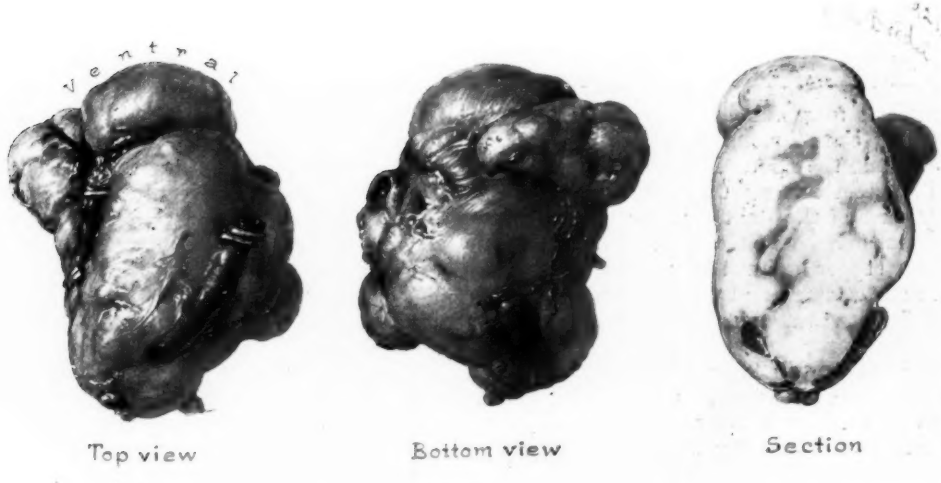

Fig. 8. Drawings of the pineal tumor, reduced one-twelfth, showing actual shape and appearance on section. Note the veins of Galen clinging to the tumor.

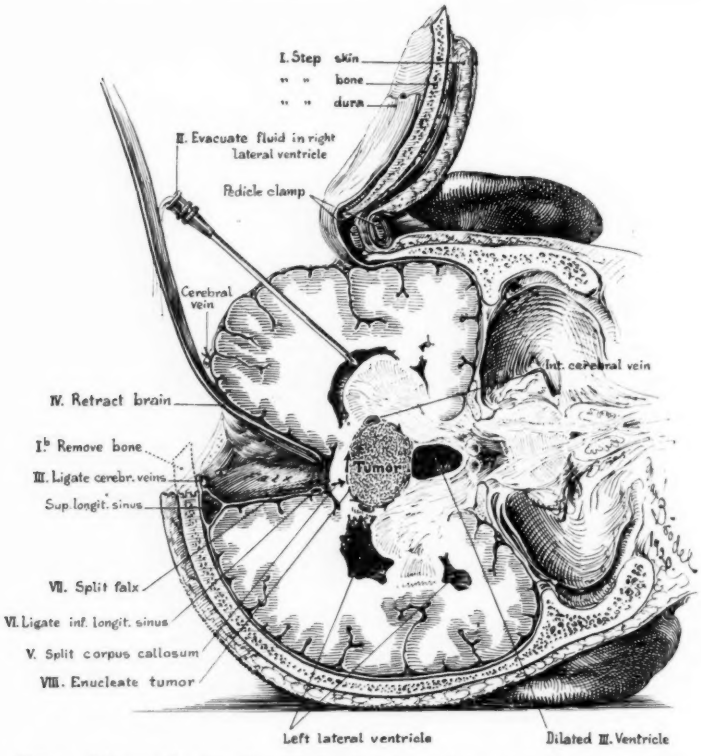

Fig. 9. Diagram by Mr. Broedel showing the various steps in the operation. The labeling adequately tells the operative story.

tubercle was removed, the tumor was approached from the left side because a deforming operation had been previously performed on the right. No speech disturbances followed in this case, although there was a weakness of the right side for several days.

After division of the cerebral veins the entire posterior half of the cerebral hemisphere can be retracted and the falx exposed. The inferior longitudinal sinus is quickly passed and the corpus callosum brought into view as the brain is still further retracted (Fig. 3). This part of the operation is bloodless and is quickly and easily accomplished. Until now there is no evidence of an underlying tumor. The posterior half of the corpus callosum is then carefully incised in the mid-line (Fig. 4) for a distance of 3 or 4 centimeters and the hemispheres still further retracted. The tumor will then be brought into full view. Under the fornix of the corpus callosum the vena Galena magna will always be brought into full view at its entrance into the sinus rectus (Fig. 5). In one of the cases here reported, the tumor lay anterior to the large vein of Galen and between it and the corpus callosum. In the other case about one-half centimeter of the great vein of Galen was free between the upper margin of the tumor and the beginning of the sinus rectus, an amount sufficient to permit double ligation and division of the vein between the ligatures. In the first case the tumor tubercle stripped readily from the vein (Fig. 5), and no bleeding resulted from the dissection. After the tumor was extirpated the great vein of Galen was seen as a tortuous trunk which when straightened would probably measure 4 centimeters

in length; the third ventricle was not opened during the enucleation of the tumor. The bed from which the tumor was removed was the roof of the third ventricle and its appearance was exactly like the photographs seen in text books showing the small vein of Galen on either side of the mid-line running a straight longitudinal course of probably 5 centimeters before they were again lost in the substance of the brain (Fig. 6).

In the second case the tumor was so large that an adequate exposure was obtained only by dividing the falx cerebri (and with it, of course, the inferior longitudinal sinus, Fig. 7). It was then possible to retract the brain to both sides. Each small vein of Galen was carefully dissected where it crossed from the tumor to the brain and divided between silk ligatures. Several small tributaries of these veins were separately tied and divided as they emerged from the tumor. No dissection was made blindly; the tumor (Fig. 8) was gradually enucleated with ease. During the removal of this tumor the third ventricle was opened and the tumor extended so deeply that the operator's finger reached the posterior clinoid process of the sella turcica. It will be evident from the ability to tie ligatures at this great depth (Fig. 10, frontispiece) and from the deep dissection of tumor which lay immediately over posterior clinoid process that operative exposure is probably sufficient. A great deal of this room is afforded by the release of fluid from the lateral ventricle by a puncture early in the operation. The hydrocephalus while so destructive of brain tissue has it compensating benefits in the amount of fluid which can be released thus allowing the reduced bulk of brain to be easily retracted from the operative field. Were it not for the release of fluid not only would the exposure of the tumor be very difficult but the necessary retraction of the brain would be very injurious to the cerebral hemisphere.

JEJUNAL ULCER[1]

By E. S. JUDD, M.D., F.A.C.S., Rochester, Minnesota

GASTROJEJUNOSTOMY for ulcer of the stomach or of the duodenum offers the patient a good prospect of complete and permanent relief of all symptoms. Because of the frequency of malignancy of the stomach and because a greater proportion of gastric ulcers is cured if the ulcers are excised in addition to gastro-enterostomy, excision should always be performed. In duodenal ulcers, either gastro-enterostomy, or excision is sufficient.

Unsatisfactory results are most often due to a gastrojejunostomy in cases in which no ulcer exists. The basis for the operation in these cases is the clinical history and either no attempt is made to demonstrate the ulcer or it is assumed that an ulcer is present when none can be located. As a matter of fact, an ulcer of the stomach or of the duodenum is seldom present without being demonstrable. More often the cause of the symptoms is located elsewhere which is further justification of a very good rule not to operate unless an ulcer can be demonstrated beyond a question of doubt. The fundamental basis for surgical procedures must be pathological and not clinical. The so-called vicious circle is now seldom heard of although a few years ago it was a much dreaded complication in these cases. The disappearance of this syndrome has been brought about partly by improvement in technique, but more particularly by the recognition of the importance of avoiding operation when no ulcer exists.

The particular phase of ulcers that I wish to discuss is the formation of secondary ulcers some time after the operation. Jejunal ulcer is one of the most serious and perhaps one of the most common after-complications of gastro-enterostomy. It occurs either in the line of anastomosis as a so-called gastrojejunal ulcer, or in the jejunum below the line of anastomosis as a true jejunal ulcer. The lesion is usually single, although multiple ulcers at the site of the anastomosis are not uncommon. In such ulcers the lesion in the mucous membrane is usually very small and, I believe, is always entirely limited to the intestinal side. The presence of œdema and adhesion to the surrounding tissues is marked and suggests that in most of these cases there has been a slow leak from a small perforation. The lesion of the mucous membrane, although it is entirely within the mucosa of the small intestine, is most often very close to the gastric mucosa. In all of the cases in the clinic the lesion seemed to be distinctly jejunal. This differs from Paterson's report of cases, for he says that in most instances the ulcer is some little distance from the stoma. Often it is situated directly opposite the opening in the stomach and nearly always in the efferent loop; it may be fully 10 centimeters from the anastomosis.

The frequency with which jejunal ulcers occur following gastro-enterostomy is difficult to estimate; Paterson reports that they occur in from 1 per cent to 2 per cent of cases. In the clinic we have found 55 definite secondary ulcers in 4,324 gastro-enterostomies, but in all probability the percentage is somewhat higher because in some instances the disturbance from the ulcer may not be sufficient to bring the patient back for treatment and, furthermore, with the return of symptoms he is likely to seek treatment elsewhere. Thus we may not see all of our patients who develop the condition. We have operated on 46 patients for jejunal ulcer in whom the primary operation had been performed elsewhere.

ETIOLOGY

A satisfactory explanation of the cause of jejunal ulcer can best be found in the etiology of the original ulcer. In not a single case in our experience did an ulcer of the jejunum occur as a primary lesion, and we have found but one case mentioned in the literature—that reported by Schmilinsky in a patient 63 years of age who had a chronic ulcer of the jejunum which was resected. In the

[1] Presented before the Association of Surgeons of St. Louis, January, 1921.

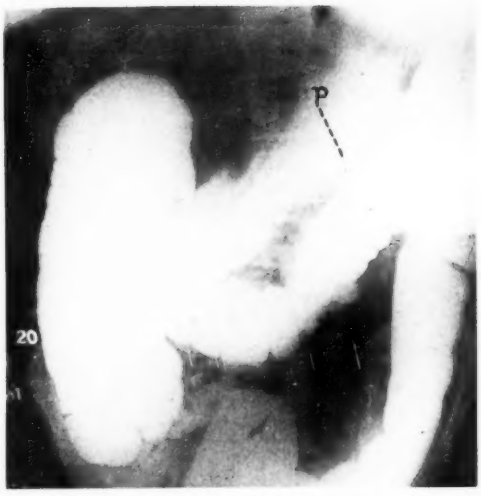

Fig. 1. (66081.) Jejunal ulcer showing gastrocolic fistula at *p*.

Fig. 2. (98054.) Jejunal ulcer. *s*, Deformity of stoma; *j*, narrowing of first part of the jejunum.

discussion of this report Frankel and Katz stated that they had seen a similar case but that they had attributed the ulcers to syphilis. Schmilinsky concluded that his case might have been syphilitic in origin, although he had no proof of this. At any rate, if jejunal ulcer occurs at all as a primary lesion it is extremely rare. It is interesting to note that jejunal ulcer following operation almost always occurs only following gastro-enterostomy for ulcer. One case has been observed in the Mayo Clinic following resection of the stomach for cancer. There are no cases following plastic procedure around the pylorus.

Undoubtedly the principal cause of the secondary ulceration is the action of the acid gastric secretion on the mucous membrane of the jejunum. In most cases of ulcer there is a hyperacidity or hypersecretion and unless this is neutralized by the bile and pancreatic secretions it may have a very toxic and destructive influence on the epithelium of the intestine. In all of Paterson's cases and in more than 60 per cent of the cases in the clinic the acids were high even after gastro-enterostomy. In the ordinary case the acid chyme is neutralized as it enters the intestine by the action of the bile and pancreatic fluids. If, however, there is any unusual change in either the amount or rate of secretion of the acid fluids of the stomach, or any change in amount, or rate, or character of the secretion of bile or pancreatic juice the neutralizing influence may be destroyed, and the contents of the jejunum may become strongly acid. Undoubtedly it is some such disturbance which allows the un-neutralized acid chyme to reach the jejunum and to afford an opportunity for the formation of jejunal ulcer.

Permanent suture material has also been a factor in the production of many ulcers, particularly those close to the gastrojejunostomy opening. In the clinic large strands of silk and linen have been found hanging from the ulcerated area several years after the operation and undoubtedly this foreign material had kept up irritation and infection. In the series of 101 jejunal ulcers in the Mayo Clinic, herewith reported, nonabsorbable suture material was found in 9 cases of the 55 in which the primary operation was performed in the clinic, and in 17 of the 46 in which the primary operation was performed elsewhere (Table 1). Recently Dr. Sistrunk cut off a gastro-enterostomy for a patient operated on 12 years before. Heavy black silk sutures were found but no evidence of infection or ulceration; nevertheless, it seems reasonable to assume that since nonabsorbable material has been discarded, fewer jejunal ulcers will develop.

TABLE I.—JEJUNAL ULCERS FOLLOWING GASTRO-ENTEROSTOMY IN 101 CASES

(Mayo Clinic, January 1, 1912, to January 21, 1921.)

	Cases	
Males	90	
Females	11	
Ulcers at the stoma	93	
Ulcers below the stoma	8	
No evidence of primary ulcer	15	
Foreign material found at secondary operation	26	
Foreign material found at secondary operation but not in vicinity of the ulcer	3	
Primary operation (Mayo Clinic)	55	
Foreign material found at secondary operation	9	(16.25 per cent)
Primary operation (elsewhere)	46	
Foreign material found at secondary operation	17	(37.77 per cent)
Types of secondary operation		
Excision and cutting off of gastro-enterostomy	28	
Excision and reconstruction of gastro-enterostomy	16	
Excision and cutting off of gastro-enterostomy:		
a. New gastro-enterostomy (one anterior)	11	
b. New gastro-duodenostomy (one anterior)	12	
Partial gastrectomy	8	
Excision of ulcer and plastic operation	16	
Excision of ulcer and pyloroplasty	10	101
Findings at secondary operation		
Large ulcers (10 perforated and 2 associated with hourglass stomach)	30	6 hard
Small ulcers (3 perforated)	42	10 calloused
Small acute ulcers	4	
Perforations (no mention of type of ulcer)	11	
Indurated ulcers	2	
Type of ulcer not classified	12	101
Marked stricture of the jejunum	3	
Dilated jejunum	2	
Œdema	3	
Linitis plastica	1	
Marked obstruction	8	
Adhesions of variable degree	54	
Additional procedures at time of secondary operation		
Appendectomy	10	
Cholecystectomy (one with pyloroplasty)	4	
Knife excision of old duodenal ulcer	9	
Cautery excision of old duodenal ulcer	1	
Herniotomy	5	
Adhesions broken up	13	
Partial gastrectomy with anastomosis for polypoid carcinoma and duodenectomy for duodenal ulcer	1	43
Gastro-enterostomies for benign ulcer from January 1, 1912 to January 1, 1921	4324	

Trauma to the tissues of the jejunum during the operation must be considered a factor in the formation of some ulcers. It has been contended that the use of rubber-guarded clamps on the stomach and jejunum is a cause, but ulcers have been reported when these were not used and it has also been shown that often the jejunal ulcer forms in the part of the efferent loop below the clamps; in 8 of the series of 101 jejunal ulcers, the lesion was several centimeters from the anastomosis; in one case it was 10 centimeters.

Infection must play some part in the etiology of these lesions. The cut surfaces of the stomach and of the jejunum are exposed to the infection from the original ulcer during operation and during the healing process which lasts about 14 days. It is questionable whether or not infection from the surface of the ulcer carried to the freshly cut area would result in the same type of lesion. Furthermore, in 15 of the 101 cases there was no evidence of an original ulcer. Moynihan mentions two such cases. The gastro-enterostomy had been performed for other conditions such as dilation or prolapse so that infection from the ulcer was not present at the time of the operation. This seems to show that a particular type of infection is not necessary for the formation of the secondary ulcer.

CLINICAL MANIFESTATIONS

The time of onset of symptoms of jejunal ulcer varies from almost immediately after the gastro-enterostomy to 8 or 10 years. In one of our cases there was relief for a very short time and then a return of all the symptoms, and within 5 weeks after the original operation a definite secondary ulcer was demonstrated by the roentgen-ray examination. The second operation, performed at that time, revealed a jejunal ulcer much larger than the original duodenal ulcer. This case also illustrates what seems to be a tendency to ulcer-forming found in an occasional patient. After the second operation, which

Fig. 3. (98939.) *s*, Deformity of stoma; *j*, narrowing of jejunum in a case of jejunal ulcer.

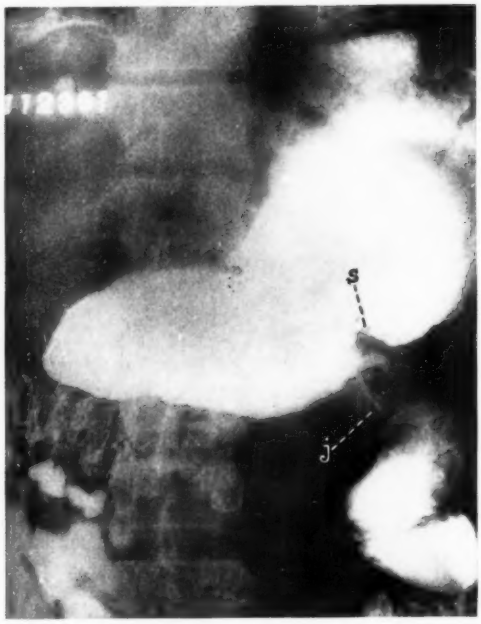

Fig. 4. (112391.) *s*, Deformity of stoma; *j*, narrowing of the jejunum near stoma in a case of jejunal ulcer.

was excision of the jejunal ulcer and plastic re-establishment of the gastro-enterostomy, the patient was placed on definite ulcer management in which he had been trained for a year previous to the first operation. He remained free from symptoms for 3 months and then had a return of all of the signs and symptoms of a jejunal ulcer which was again demonstrated by the roentgen-ray. At the third operation, just 3 months after the first, a jejunal ulcer was found on the afferent side of the stoma, which was opposite the location of the former jejunal ulcer. At this time the gastrojejunostomy was undone and the duodenal ulcer excised. The patient has now been free from symptoms for about 2 years. Several cases similar to this one have been reported, and even three or four operations for recurring ulcers have been performed. A detailed study of the blood of the patient was made and a thorough examination of the foci for any source of infection, but reason for his tendency to develop ulcers could not be found.

Usually all symptoms are completely relieved following gastro-enterostomy for from 6 months to 1 year (Eusterman); then there is a gradual return of all of the evidences of ulcer. Often the manifestations are not quite so severe as they were originally; the pain is usually described as lower in the abdomen and more to the left, without periodicity, and the relief of pain by food and alkalies is not so complete. Although hæmorrhage from the stomach or bowel is not common with the secondary ulcer, when it does occur it is suggestive of ulcer, especially if there has been no bleeding before the first operation.

I know of only one case of perforation of a jejunal ulcer into the abdominal cavity. A gastrojejunostomy had been performed on this patient 4 years previously and he was completely relieved for some time. Four years later he was operated on elsewhere for an acute perforation of a jejunal ulcer. Wright reports that he found records of 31 acute perforations in 135 cases and states

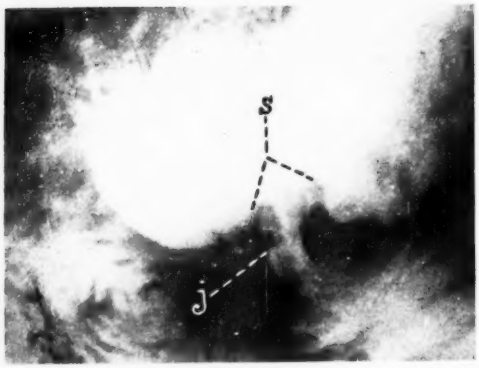

Fig. 5. (127252.) *s*, Deformity of stoma; *j*, narrowing of the efferent loop of the jejunum in a case of jejunal ulcer.

that perforation is more common following anterior gastro-enterostomy than after posterior gastro-enterostomy.

I have been particularly interested in a group of cases in which the ulcer perforated into the colon, forming a gastrocolic or jejunocolic fistula. Bolton and Trotter state that a trifle more than 10 per cent of jejunal ulcers become adherent to the colon and perforate into it. They collected 31 such cases, including 4 of their own. If the ulcer is in the jejunum the colon may easily come into contact with it and as the ulceration extends it may perforate directly into the colon. However, in the 6 cases of colonic fistula in the series of 101 ulcers the perforation occurred more often when the ulcer was close to the mucosa of the stomach. In such cases the ulcer extends into the mesocolon so that it becomes involved in the ulceration and is greatly thickened and œdematous. This later contracts and pulls the colon down onto the anastomosis and a fistula follows. In performing the primary operation this may be prevented by suturing the edges of the opening of the mesocolon well back onto the surface of the stomach and making the opening as near as possible to the root of the mesocolon so as to keep the colon well away from the suture line. The first intimation the patient has of the existence of a fistula into the large intestine is a persistent diarrhœa, the vomiting of fæcal material, and belching of foul-smelling gas. If the fistula is large and especially if it is of the gastrocolic type, diarrhœa is produced almost immediately after food is taken into the stomach and the food is passed in much the same form that it was taken. Emaciation becomes marked very quickly. In one of our cases complete relief of all gastric symptoms was obtained by gastro-enterostomy and there was no suggestion of further trouble until 5 years later when the patient was seized with an attack of persistent diarrhœa. A roentgen-ray examination of the colon made a few minutes after a bismuth enema revealed a considerable portion of the bismuth in the stomach. In the other cases there was the usual history of jejunal ulcer for some time before evidence of a fistula into the colon. If the fistula is small and is between the jejunum and the colon it may produce diarrhœa and vomiting of fæcal material at intervals; at other times the food is passed normally and the fistula seems to be closed.

DIAGNOSIS

Jejunal ulcer is always to be suspected when a recurrence of symptoms follows an interval of relief as a result of a gastro-enterostomy for ulcer. These symptoms may be the result of reactivation of the original ulcer but in most instances they are due to a secondary ulcer. The development of malignancy must also be considered as well as an inflammation in the appendix or in the gall-bladder. Roentgen-ray examination offers the most accurate method of differential diagnosis (Carman). A fistula into the colon may or may not be determined by the roentgen ray. In some of the cases in which a large fistulous opening was found at operation the opening had not been demonstrated by the roentgen ray but a jejunal ulcer had been demonstrated.

TREATMENT

The possibilities of prophylaxis, I believe, have not been considered sufficiently in the treatment of jejunal ulcer. We must recognize the fact that it is not enough to perform a gastro-enterostomy and dismiss the patient without further treatment. Fewer

Fig. 6. (160721.) Duodenal ulcer. *u* indicates the deformity due to ulcer.

Fig. 7. (160721.) *s* indicates the deformity of the stoma due to jejunal ulcer seven weeks after operation for duodenal ulcer shown in Figure 6.

secondary ulcers will occur if other foci of infection within the abdomen are eliminated together with the more commonly recognized areas for focal infection. Reducing trauma to the tissues and dispensing with the use of nonabsorbable suture material will tend to reduce the number of these cases. No doubt we have all paid too little attention to the after-care, especially the diet. Cases are reported in which a secondary ulcer followed very soon after a gross indiscretion in diet. Much can probably be accomplished if the patient is restricted and kept under a certain régime for a certain time.

If jejunal ulcer is diagnosed and the symptoms are mild it is well to try medical management with the hope of obtaining relief, although in the clinic usually we are not able to relieve these patients except by operation. Our experience leads us to believe that the best plan to follow at operation is to undo the gastro-enterostomy, excise the jejunal ulcer, close the opening in the stomach and intestine, excise the original ulcer, and at the same time perform a plastic operation on the pylorus if it seems best. In some instances it is necessary to re-establish the gastro-enterostomy or make a new one, but if possible, this should be avoided because more ulcers form in spite of all precaution.

In case a fistula has formed between the stomach and the colon or between the small intestine and the colon, the operation is liable to be tedious and difficult. A number of cases are reported in which it was necessary to excise a part of the jejunum, colon, and stomach, which makes a very formidable procedure. A large tumor is generally present at the site of the anastomosis but it is made up of greatly thickened and œdematous tissue. When a cleavage line is started in these tissues, often the old anastomosis can be exposed, the colon separated, and the opening in it closed. The stomach and the jejunum may then be separated and these openings closed. This is much simpler than resection and should be done when possible. This plan was carried out in 4 of the 6 cases of fistula. In one, a partial resection was required, and in one a complete resection. In one of the cases a gastroduodenostomy was made after the jejunal ulcer was excised.

RESULTS OF TREATMENT

The results of the operations in these cases of secondary ulcer have been reasonably satisfactory, especially since the importance of dispensing, whenever possible, with the gastro-enterostomy has been realized. If a secondary ulcer has once formed after gastro-enterostomy it is surprising how many will continue to form if the anastomosis is main-

tained in these patients who seem to have some definite irregularity or specific infection. In a few instances I have observed such repeated occurrence in spite of the fact that alkalization and systematic postoperative management were established and kept up from the time of the operation. Ballance mentions two cases in which alkalies did not prevent the occurrence. Nevertheless, I believe that proper management during the healing of the tissues following gastro-enterostomy and for some time afterward offers a great deal in the prevention of secondary ulcers.

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CLINICAL USES OF SALT SOLUTION IN CONDITIONS OF INCREASED INTRACRANIAL TENSION

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IT has been shown experimentally that the pressure of the cerebrospinal fluid and the bulk of the brain can be reduced by the intravenous injection of a hypertonic solution. The occurrence of these changes was first demonstrated by Weed and McKibben (1, 2) in experiments on cats. It must have occurred to many that these experimentally produced changes might have a clinical value if capable of production in the human subject without untoward effects.

The purpose of the present paper is to describe these physiological responses as seen in the human subject. Certain factors which influence the changes have been brought out and will be detailed in their relation to the physiology and clinical application of the procedure. The method has been employed in a number of cases exhibiting increased degrees of intracranial tension. From these cases impressions have been gained as to certain details of the physiological mechanism involved and pathological conditions affecting its usefulness.

The first report of the clinical use of this principle was by Haden (3). In cases of cerebrospinal meningitis in which pressure symptoms developed (presumably due to blocking of the pathways of escape for cerebrospinal fluid) symptomatic improvement followed the intravenous injection of 40 per cent glucose solution. No more objective proof of the action of the solution was offered. With Dr. Cushing the present author (4) made a preliminary report of the objective demonstration of these changes in the human subject. Following this, Sachs (5) reported its use in two surgical cases showing increased intracranial tension and believed the procedure could be employed with usefulness.

The observations on patients recorded here were conducted coincidentally with an extension of the experimental phase of the subject. In these experiments (6) the effect of gastro-intestinal doses of salt solution, or salt ingestion[1] were investigated, for it was feared that the medullary depressant effects of intravenous doses might preclude their clinical use. Subsequently this fear has been shown to be not entirely warranted.

[1] "Salt ingestion" as distinguished from the intravenous injection in the experiments of Weed and McKibben.

The experiments demonstrated, however, that gastro-intestinal doses of salt work the same reduction in cerebrospinal fluid pressure and brain bulk as intravenous doses. The changes are not accompanied by medullary depressant effects.

PHYSIOLOGICAL

Conditions approaching very closely the laboratory experiments were obtained by recording the cerebrospinal fluid pressure changes in a manometer connected to a lumbar puncture needle. Observations were made following both salt ingestion and intravenous injection. A manometer was employed of large enough bore to prevent great oscillations due to respiration or slight movements. These temporary pressure changes were further minimized by the use of a long needle of small caliber. The manometer was filled with normal (physiological) saline to 250 millimeters. The connection to the lumbar puncture needle was promptly established and without an appreciable loss of fluid from the canal. The curve obtained from such an observation is roughly the curve of mean pressure of the cerebrospinal fluid. After establishing the manometer connection the patient was given either sodium chloride in capsules by mouth or an intravenous injection of 15 per cent sodium chloride solution.[1] One of the curves is shown in Figure 1. It is self-explanatory. In other cases it has been found that if the column of fluid in the manometer is raised to a high pressure by the addition of fluid, absorption promptly takes place to an extent sufficient to re-establish the pressure existing before the manometer was raised. This obtains even when a low pressure has been established by salt injection.

While these observations demonstrated the same changes in pressure as occur in experiments, they gave no indication of the effects on brain bulk. In the laboratory experiments such observations were carried out by watching the protrusion or recession of the animal brain through a trephine opening in the skull. Opportunity for similar

[1] Lumbar puncture was done in these cases for the purpose of intraspinous treatment of lues in connection with which the salt solutions have been employed—observations to be reported later.

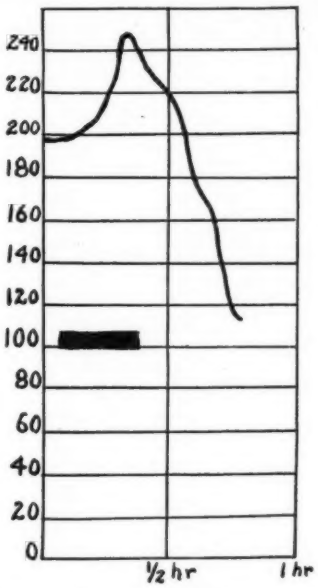

Fig. 1. Curve of pressure (millimeters normal saline) recorded by a manometer connected to a lumbar puncture needle. At the point indicated the patient was given 190 cubic centimeters of 15 per cent sodium chloride solution intravenously.

observation was afforded by patients with protusions following decompression operations. In these cases the operation had been done for increased tension incident to presumed intracranial tumor growth. The underlying lesion doubtlessly conditioned the responses which for this reason cannot be considered as strictly physiological. It was noted that the change in bulk was much greater in the presence of an internal hydrocephalus than in the cases where the ventricles were not dilated. With these allowances the responses may be interpreted as physiological. They also offer an explanation of the discrepancies between the effects produced in some of the clinical cases described in a later section. The accompanying photographs illustrate the changes in the two types of case.

The patient in Figure 2 had a large glioma of the right temporal lobe disclosed during a decompression operation. Subsequently an enormous, tense protrusion developed at the decompression site. The photograph,

Figure 2, illustrates the condition before salt was given. Immediately after making the photograph the patient was given 100 cubic centimeters of 30 per cent sodium chloride solution by mouth. There was a gradual decrease in the tenseness of the protrusion which became obviously softer and somewhat smaller. The circumference of the head above the brows decreased from 60 centimeters to 59 centimeters. The photograph Figure 3 was made two hours after taking the salt solution. The protrusion had become very much softer and as may be seen there was a very appreciable decrease in its size.

The patient in Figure 4 presumably had a tumor. It was never disclosed. At the decompression operation a marked internal hydrocephalus was found, a large amount of fluid being obtained by puncture of the right lateral ventricle. There was considerable collapse of the brain following this. As is common in cases of hydrocephalus, the protrusion which subsequently developed at the decompression site was extremely tense. Figure 4 shows the condition before the administration of salt. The other photographs (5 to 7,b) were made at approximately one hour intervals following the taking by mouth of 80 cubic centimeters of 30 per cent sodium chloride solution. The changes here were extensive. At the end of 3 hours the tense protrusion had become a soft concave area about which the margins of the bone defect were clearly outlined.

The observations which these photographs illustrate deal primarily with changes in brain bulk though in the second case the volume change observed must have been due largely to an absorption of fluid from within the ventricle. (*Vide infra.*)

An attempt was made to study the volume changes in such cases in relation to the coincident pressure changes. To this end an apparatus was arranged which we have called a "balloon-cast-manometer system." It is shown in Figure 8. A plaster-of-Paris cast of the protrusion with the surrounding area was made. Into the hollow of this cast, made by the protrusion, a toy balloon was fixed with its stem extending through a hole to the outside of the cast. The cast was applied to the hernia with the balloon lying between. The stem of the balloon was connected by tubing to a manometer and the system filled with water. Such an apparatus is similar in principle to the ordinary clinical sphygmomanometer used in blood pressure determinations. By means of a stop cock and side connection to a fluid reservoir it was possible to alter at will the volume of fluid contained in the system. After filling the system at medium pressure (150 millimeters H_2O) and then raising the manometer column to a high pressure it was found that the column would come to rest at a constant level of approximately 250 millimeters. This equilibrium at a constant level is apparently established by the absorption of fluid at the artificially increased pressure.

With this apparatus observations were made of the pressure and volume changes in a decompression protrusion in a patient who had an intracranial tumor. Needle exploration at operation had failed to disclose a dilated ventricle. The observations were made 2 months following the decompression operation. A tense cerebral protrusion had developed. By preliminary test the column of fluid was found to come to rest at 230 to 240 millimeters H_2O. Sixteen grams of sodium chloride were now given in 2 gram capsules accompanied by 80 cubic centimeters of water. The fall of pressure which this produced is shown by the curve Figure 9. The coincident decrease in brain-cerebrospinal fluid volume as determined by the fluid displaced out of the manometer with falling pressure is represented by the same curve. The figures to the left indicate pressure change in millimeters H_2O, those to the right volume change in cubic centimeters. Thus the fall of pressure from 240 millimeters to 80 millimeters was accompanied by a decrease of brain-cerebrospinal fluid volume of 3.2 cubic centimeters. The fall of pressure was rapid. At the end of the observation fluid was allowed to run from the reservoir into the system under the same pressure as existed before salt was given—240 millimeters. Under this artificially increased pressure further decrease in volume to the extent of 17.4 cubic centi-

meters took place. After the cast was taken off and this high external pressure removed, the protrusion was observed for several hours. It remained soft but without further diminution in volume. No such change in bulk occurred as was observed in the internal hydrocephalus patient shown in the photographs Figures 4 to 7b.

Thus it is seen that salt solution will produce a rapid and extensive fall of pressure but under the lowered pressure so produced and in the absence of a dilated ventricle the volume change is not great. If the original pressure now be artificially maintained further decrease in volume occurs, but to a relatively small extent, 17.4 cubic centimeters.

A similar observation was conducted in the case of the patient with the dilated ventricle shown in Figures 4 to 7b. The pressure and volume change following 90 cubic centimeters of 30 per cent sodium chloride solution is shown in Figure 10. In time relation to the taking of salt solution the curve represents the same period covered by Figures 4 and 5. The fall of pressure was at a slower rate but just as extensive as in the previous case. For the period covered by the curve the volume change was only 3 cubic centimeters. But now when the protrusion was subjected to the pressure which had existed before salt was given (220 millimeters) it underwent a further marked decrease in volume of more than 50 cubic centimeters. After the cast had been removed the volume continued to diminish somewhat even in the absence of the artificially increased pressure.

Thus it is seen that in the presence of a dilated ventricle salt solution produces the same extensive fall of pressure but at a slower rate than when this condition is absent. But the eventual volume change is much greater in the case of the dilated ventricle and will occur spontaneously without artificially raising the pressure under which the fluid is absorbed.[1]

[1] So far as we are aware these changes observed in the human subject are the first observations of the sort recorded. In the preliminary report, to which reference is made in the text (4), the whole detail of the observations including a description of the apparatus, for the sake of brevity, was not set forth. Since then Ebaugh and Stevenson (Johns Hopkins Hospital Bulletin, vol. xxxi, p. 440) have described a somewhat similar apparatus in which an inverted tambour was applied to the protrusion. Readings were taken and the values interpreted in terms of intracranial pressure in accordance with the calibration of this apparatus. We believe that for study of the changes in the human subject our method is the more accurate.

Fig. 2 (at left). Patient with large glioma of right hemisphere. A very large, rather tense protrusion. Condition before salt ingestion.

Fig. 3. Same patient 2 hours following 100 cubic centimeters of 30 per cent sodium chloride solution by mouth. The protrusion has become rather soft. Note the appreciable diminution in size.

DISCUSSION

The observations which have been presented are to be explained in terms of alterations in the fluid production and absorption mechanism. The same changes found in animal experiment occur in the human subject. The details of the process appear to be the same in the two.

The increased osmotic value of the blood occasioned by the solutions introduced into the body promotes the absorption of fluid from the cerebrospinal spaces at an increased rate. This absorption of fluid will continue even under the lowered mechanical pressure which results. On the other hand, the rate of fluid formation by the choroid plexus is diminished or arrested. Even in the presence of the lowered mechanical pressure fluid is not elaborated. The effect of these changes is a marked lowering of intracranial fluid pressure.

Ebaugh and Stevenson studied intracranial pressure relationships in an epileptic and found the attacks to be preceded by and associated with increased tension. An interesting corroboration of this is found in one of our first cases studied. The patient had an intracranial tumor and was subject to Jacksonian attacks. There were definite auræ. During the process of making a lumbar puncture observation there were two sudden rises of pressure of 100 millimeters. Each time this pressure rise occurred the patient said "I feel a spell coming." No seizure actually occurred.

Fig. 4 (at left). Patient with dilated ventricle. An extremely tense protrusion. Condition before salt ingestion.

Fig. 5. Same patient 1 hour following 80 cubic centimeters of 30 per cent sodium chloride solution by mouth. The protrusion has become very soft. Note the appreciable diminution in size.

The mechanism by which increased intracranial tension is produced is a problem which in spite of much study remains without solution. The observations recorded in the previous section render very little toward a proved solution of the problem but together with the extensive clinical use of salt solution in conditions of increased tension they have led to speculation concerning the mechanism by which the condition is produced. Though lacking in absolute proof it may be of interest to express these speculative views since they offer an explanation of the phenomenon as it occurs under different pathological alterations and as affected by salt solution.

It is possible that with tumor growth or ventricular obstruction the brain at certain points is pressed securely against the dura closing off a number of the pathways of fluid escape through the arachnoid villi and along the sheaths of the cranial nerves. This narrowing of the absorption bed now causes the fluid to be held under increased tension. Were the absorption mechanism reduced to zero by closure of all these pathways the fluid tension should finally be equal to the maximal pressure against which the choroid will produce fluid.

If the disturbance is occasioned by solid tumor growth, with its surrounding area of brain œdema, the enlarged brain substance may itself, crowded into the rigid cranium, be under increased tension by its contact with the cranium, and quite independently of the fluid tension in the cerebrospinal spaces. Under such circumstances the subarachnoid fluid spaces would be encroached upon to the extent that the brain could be molded into the many fluid-containing crevices. The volume of fluid contained within the cranium would be small. Following salt ingestion the absorption of fluid from the remaining crevices reduces fluid pressure though the pressure of the brain substance against the cranium may not be relieved. Relief of the latter condition can only be accomplished by absorption of fluid from the brain substance itself (dehydration). If the tumor growth be large, relief by this means need not be complete. With an open skull (decompression) the volume change of the intracranial contents following salt solution would not be great.

These conceptions have been supported by our observations. The photographs (Figs. 2 and 3) of the patient with a solid tumor unaccompanied by ventricular dilatation show a trifling volume change. In another patient the measured volume change even under added external pressure was only 17.2 cubic centimeters.

If the disturbance is occasioned by a tumor causing ventricular obstruction and dilatation the pressure of the brain against the dura may interfere with fluid absorption from the subarachnoid spaces in the same way. If the fluid contained in the obstructed ventricle could not be absorbed the effect of salt ingestion here should be the same as in the former case where there was no dilatation of the ventricles. Such has not been the case. The observed changes under these conditions showed an extensive volume change (Figs. 4 to 7,b) while the measured volume change was more than 50 cubic centimeters though accompanied by a pressure decrease similar to that seen in a case of solid tumor without internal hydrocephalus.

It has been shown experimentally (7) that following salt ingestion absorption does take place from within the ventricles. The current in the aqueduct and ventricular system is reversed, fluid now passing from subarachnoid spaces to the ventricles. Here a reabsorption through the choroid plexus has been

Fig. 6a. Front view same patient 2 hours and 10 minutes following salt ingestion.
Fig. 6b. Same. Side view.

Fig. 7a. Same patient 2 hours and 55 minutes following salt ingestion.
Fig. 7b. Same. Side view.

demonstrated. This alteration in the absorption mechanism appears to take place in the human subject. In cases of internal hydrocephalus the great volume change of the cranial contents following salt ingestion is to be explained on this basis.

CLINICAL USES

Clinically there are a number of conditions in which increased intracranial tension may develop. When present in appreciable degree it gives rise to the well known pressure phenomena—headache, projectile vomiting, slow pulse, and choked discs; with more extreme grades Cheyne-Stokes respirations, somnolence and unconsciousness ensue. The headache may be extreme and in general is the most troublesome subjective symptom. The more extreme grade of tension may become a condition of vital importance and determine the outcome in a given case. Marked tension offers a serious difficulty in intracranial operations. A brain of large bulk under great tension may make an operative procedure impossible. In such a case drainage of the cerebrospinal spaces is of no avail for the difficulty lies in the overcrowding of the brain substance itself.

In hydrocephalus ventricular puncture may be attended by excellent results, the pressure symptoms clearing up at once. Tension developing in a case of meningitis may be relieved by spinal drainage. Spinal drainage is not applicable in cases of intracranial tumor because of the danger of herniation of the brain stem through the foramen magnum. In the majority of these cases there has been no adequate means of dealing with tension short of a decompression operation or ventricular puncture.

From our experiences so far we believe that hypertonic salt solution intravenously or the gastro-intestinal ingestion of salt can be employed with some degree of success in a selected group of cases. The results to be expected in a given case are determined by the details of the pathology giving rise to the condition. The principles underlying these pathological alterations have been detailed in an earlier section.

The following brief abstracts of some illustrative cases indicate something of our experiences with the clinical employment of the procedure. In the first five cases there was tumor without dilatation of the ventricles. In the last four cases there was a ventricular hydrops associated with the tumor. There is a striking difference in the results as between the two classes.

CASE 1. S. C., age 40, had a malignant adenoma of the pituitary. Two transphenoidal operations were done during the past 4 years. Each time a part of the tumor was removed. Three months ago the severe frontal headaches recurred associated with increasing drowsiness, apathy, and impairment of mentality.

During one of the severe headaches, which actually were almost continuous, 50 cubic centimeters of 15 per cent sodium chloride was given intravenously. There was very slight if any improvement.[1]

CASE 2. A. A., age 41, had a large suprasellar growth. There were well marked pressure phenomena.

At operation an extremely tense brain was disclosed. Puncture of the ventricle failed to reach fluid. An attempt was made to relieve the pressure by salt solution. One hundred cubic centimeters of 15 per cent sodium chloride was given intravenously over a period of 22 minutes. There was a sufficient decrease of tension to permit of sufficient elevation of the frontal lobe to expose the pituitary region.

CASE 3. M. M., age 18, had severe frontal and occipital headache. The detailed neurological examination indicated a left cerebral lesion. The pressure phenomena were well marked. There were bilateral choked discs. A left subtemporal decompression was done. A dilated ventricle was not disclosed by puncture. A tense protrusion developed at the decompression site.

Three weeks following operation signs of marked tension developed. She was drowsy and in poor condition. Fifteen grams of sodium chloride were given in capsules by mouth accompanied by a little water. An hour later the protrusion had become soft and lumbar puncture was done. The fluid was found under apparently normal tension. Following this the condition seemed somewhat improved.

Two days later the condition again became very poor. The patient would not respond. The decompression was extremely tense. Cheyne-Stokes respirations developed. Eighty cubic centimeters of 30 per cent sodium chloride solution were given by nasal tube. Within 10 minutes the Cheyne-Stokes respiration stopped, the patient opened her eyes and looked about. This period of relief was brief. Death occurred the following day. The autopsy showed a huge glioma of the left hemisphere.

CASE 4. M. W., age 34, had headaches for 2 years, severe for the past 5 months with projectile vomiting; bilateral choked discs with marked impairment of vision. The other details of the neurological examination indicated a right cerebral lesion.

August 23 there was a particularly severe headache. The patient was somnolent and unco-operative. She was given 50 cubic centimeters of 15 per cent sodium chloride solution. Within 5 minutes the headache was entirely gone for the first time in several weeks. Three hours later she was completely free of headache. Tests showed a distinct improvement in visual acuity following the injection.

Four days later a right subtemporal decompression was done. There was marked tension. Dilatation of the ventricle was not demonstrated by needle punctures. Four months later a right sided exploration was done. The exact location of the lesion was not disclosed.

CASE 5. T. G., age 42, had very severe headaches and projectile vomiting. There were bilateral choked discs with marked secondary atrophy and near-blindness. The detailed neurological examination indicated a lesion of the left hemisphere.

A subtemporal decompression was done. Half an hour before operation he was given 16 grams of sodium chloride in capsules by mouth accompanied by a little water. The dura when exposed did not appear to be under increased tension. There was no protrusion of the cortex when the dura was incised. No dilatation of the ventricle was disclosed by puncture.

It was felt in view of the preoperative findings that a very tense brain would have been found at operation had not salt been given. Following operation the protrusion became very tense.

CASE 6. J. C., age 12, had severe frontal headache accompanied by projectile vomiting. There was primary optic atrophy and destruction of the dorsum sellæ. A transfrontal pituitary operation disclosed a cyst in the pituitary region with an internal hydrocephalus. The cyst was evacuated.

Ten days later pressure signs reappeared which reached a climax in the afternoon. The pulse was slowed and he became much excited and irrational. The headache was extreme.

Eighty cubic centimeters of 15 per cent sodium chloride solution were given intravenously. Within 10 minutes the patient quieted down and said the headache was almost gone. He slept for 2 hours. When awakened he said the headache was very slight. The relief appeared to be permanent.

CASE 7. W. W., age 17, had severe frontal headache for 6 months. There were attacks of suboccipital and posterior cervical pain. Bilateral choked discs were found and the detailed neurological examination indicated a cerebellar lesion.

At 2:00 p.m. on the day of admission he complained of pain in the back of neck and became rather somnolent. This passed off. At 7:00 p.m. the same sort of attack began again. Patient acted peculiarly, was unco-operative and obstinate. Sat motionless on side of bed with the neck flexed far forward and forehead held in hands, complaining of headache. Would not move for fear of pain. Would scarcely reply to questions and then with dysarthria.

Patient was moved back into bed and propped up on pillows. One hundred cubic centimeters of 15 per cent sodium chloride were given intravenously. Headache and pain in neck promptly subsided, apathy and stupor disappeared and the patient slid down in bed and lay on his back without distress. He talked freely of the immediate improvement and was grateful. The nystagmus which had been present before had now (20 minutes after salt injection) disappeared. The changes were well marked objectively as well as subjectively.

[1] Dr. Cushing's interpretation of this was that the patient's discomforts were therefore not due to an increase of intracranial fluid tension.

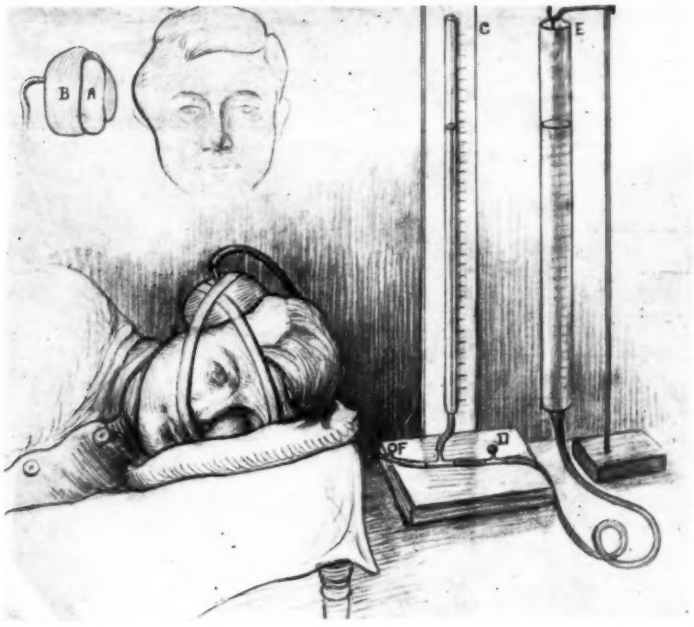

Fig. 8. To illustrate the apparatus used in recording measured volume change in relation to pressure change. *A*, The toy balloon contained in the cast, *B*, of the protrusion. The sketch also shows the cast applied to the protrusion. *C*, The water manometer connected to the balloon by tubing. *D*, Stop cock and side connection to the fluid reservoir, *E*. By closing the stop cock *F*, and opening *D* the manometer column could be raised or lowered to any desired point. By raising the reservoir with the stop cocks *D* and *F* open, it was possible to subject the protrusion to a constant pressure and at the same time measure the volume change by the amount of fluid which was displaced out of the reservoir.

CASE 8. M. T., age 34, had signs of pulmonary tuberculosis. Severe fronto-occipital headaches for 5 months. There were bilateral choked discs with secondary optic atrophy. The detailed neurological examination indicated a cerebellar lesion, probably a tubercle.

Beginning at 8:00 a.m. patient began to have pain in the back of the neck. It grew steadily worse.

10:30—Intense headache.

11:00—6 grams aspirin.

11:30—No relief. Patient says headache is most severe she has ever had. Writhes about in bed crying out with pain.

12:00—16 grams sodium chloride in capsules by mouth accompanied by 80 cubic centimeters of water. Within 10 minutes slight improvement was noted.

12:30—Quiet. Headache almost entirely gone. Very grateful, says she has never had such prompt and complete relief from these headaches.

12:50—No headache. Vision distinctly clearer, no diplopia. Is able to read a postal card received in mail today. Patient usually has marked dimness of vision and diplopia which become worse during the severe headaches. Ordinarily she is unable to read her mail.

The freedom from headache continued. There was no recurrence of it the following day.

Subsequently a cerebellar exploration was performed. She had a cerebellar glioma (verified) with hydrocephalus.

CASE 9. A. C., age 52, had an intracranial tumor which at first gave no localizing signs. A subtemporal decompression was done. A tense protrusion developed. At a later time a suboccipital exploration was done with the disclosure of a cyst in the left cerebellar hemisphere.

January 20 the protrusion was very tense. The patient complained of headache and fullness in the head. One hundred and twenty cubic centimeters of 15 per cent sodium chloride were given intravenously. There was definite relief—the headache ceased and the sense of fullness in the head disappeared. Figure 11 shows the condition before salt was given. The condition two hours later is shown in Figure 12.

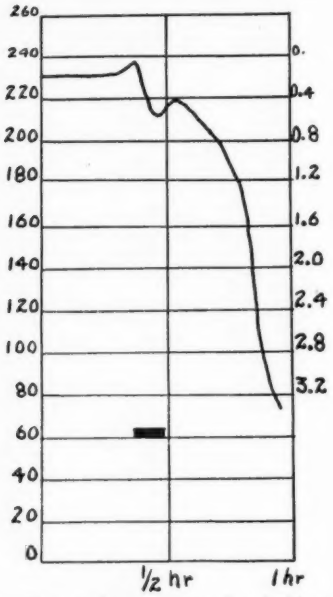

Fig. 9. Curve of pressure and coincident volume change obtained by the apparatus shown in Figure 8. The patient had a solid tumor. The figures to the left indicate pressure change in millimeters of water, those to the right the volume change in cubic centimeters. At the point indicated the patient was given 16 grams of sodium chloride in capsules by mouth.

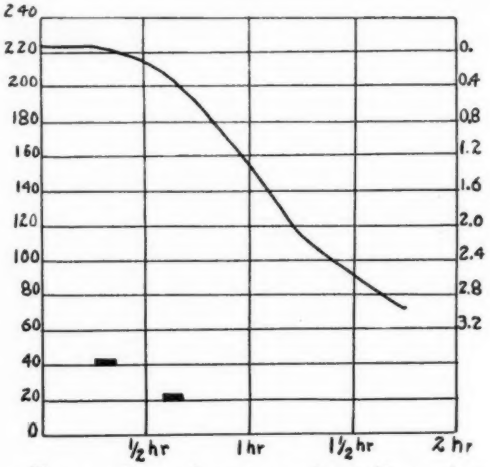

Fig. 10. Curve of pressure and coincident volume change. The figures to the left indicate pressure change in millimeters of water, those to the right volume change in cubic centimeters. The patient was given 50 cubic centimeters and 40 cubic centimeters of 30 per cent sodium chloride solution by mouth at the points indicated.

As stated, in the first five patients the increased tension was not associated with ventricular dilatation. In these patients the injection of salt solution was not attended by striking results.

In Case 1 a large solid tumor at the base was known to exist. No objective change was produced and symptomatic improvement was trifling or absent following salt injection. In Case 2 there was also a large basal tumor. The salt solution may have been of considerable value in effecting the exposure at operation but this is a difficult thing to estimate. In the third case there was a large, solid tumor of the hemisphere and the tension was not accompanied by a dilated ventricle. Salt solution produced a fall of fluid pressure as shown by the normal tension found on lumbar puncture. Sustained improvement in the extreme pressure symptoms could not be produced. Whatever dehydration of brain substance occurred was not sufficient to relieve the overcrowding of the cranial chamber. In the fourth case, presumably one of solid tumor, but at least not accompanied by internal hydrocephalus, the improvement following salt was perfectly definite. Here there must have been sufficient fluid to be drawn upon, or the tumor if present was of such small size that the dehydration of brain substance was effective in lowering pressure. In the fifth case operation following salt ingestion disclosed a brain under practically normal tension. Clinical manifestations of pressure indicated that without salt a tense bulging brain would have been encountered. The lesion here must have been of such size or so located that even in the absence of a dilated ventricle there was sufficient fluid absorption to produce a diminution in brain bulk and pressure.

In the last four cases a dilated ventricle was present. Here a large volume of fluid was contained within the cranium. Although held within the ventricular system, it apparently was available for absorption. Striking objective change and marked symptomatic improvement attended the use of salt in all these cases.

DISCUSSION

This procedure has a definite clinical usefulness. The results to be expected in a given case are determined largely by the pathological conditions giving rise to the increased tension. A distinction should be made between fluid tension *per se* and increased tension resulting from enlargement of brain bulk. In the former obstruction to fluid absorption is primary and is the essential feature. It is best illustrated by cases of internal hydrocephalus resulting from obstruction of the iter. In the latter an increased brain bulk is primary and is the essential feature. In both cases the pressure of the brain against the skull diminishes the volume of the subarachnoid spaces and obstruction to fluid absorption through the arachnoid villi probably ensues. From the standpoint of promoting fluid absorption from these obliterated spaces little is to be expected from the use of salt solutions. The presence of a large amount of intraventricular fluid in the hydrocephalus cases makes them amenable to relief by this means, for the fluid can be absorbed from within the ventricles. In the cases of increased tension resulting from enlarged brain bulk it would appear that relief can be secured only when the fluid spaces are not completely obliterated and contain an appreciable amount of fluid or at least when the limited absorption here is combined with an appreciable dehydration of brain substance. In the cases of very extensive tumor growth, "dry" brains with flattened convolutions and obliterated fluid spaces, the perivasculars and other fluid containing spaces of the brain substance are probably collapsed and little should be expected from dehydration.

Increased pressure associated with inflammatory processes in the meninges may represent a third type of fluid tension. Here the obstruction is near the arachnoid villi and is due to the inflammatory reaction about these structures. Weed (8) was able to cause such obstruction experimentally by injecting carbon granules into the subarachnoid spaces. Such cases appear to be another example of fluid tension *per se*. In cases of meningitis brain œdema doubtless enters into the mechanism, and possibly contributes to increased tension by obstruction to fluid absorption through the arachnoid villi by means of the pressure of the brain against the dura just as in tumor or in hydrocephalus. We have had no opportunity to study such cases but conceivably salt solutions would be effective for even though the fluid spaces should be nearly obliterated dehydration of an œdematous brain probably would be extensive.

Fig. 11 (at left). Patient in Case 9 before administration of salt solution.

Fig. 12. Same patient 2 hours following the intravenous injection of 120 cubic centimeters of 15 per cent sodium chloride solution.

The procedure has been employed in many cases in addition to those presented. In a general way they have borne out the above interpretation of the parts p ayed by different pathological arrangements. Practically the administration of large doses of salt has been the most valuable therapeutic agent so far used in the treatment of "pressure headaches." Their action in the cases of headache associated with internal hydrocephalus has been very striking. Where the headache is unassociated with this condition some degree of relief usually is to be expected. Where it is desirable to make a lumbar puncture for diagnostic purposes in cases with increased tension the dangers of the procedure can be obviated in certain of the cases by first reducing the pressure by giving a hypertonic solution. The difficulties in anæsthesia so often met with in cases exhibiting marked degrees of tension can in part be overcome. This has been observed particularly in cere-

bellar operations. The procedure probably has some value in diminishing tension and aiding exposure at operation. By this means the risks of opening a very tight dura might be avoided. Where a decompression protrusion exists the presence or absence of an internal hydrocephalus can be demonstrated. If the ventricles are greatly dilated the protrusion will practically disappear following a large dose of salt, whereas if the protrusion is due to solid tumor growth the protrusion merely becomes softer and slightly smaller. This point may be of considerable diagnostic value. Possibly certain cases might be tided over periods of acute pressure though our experiences in such cases so far have not been striking.

We have reason to hope that the administration of salt, through relief of pressure, may permit more exact clinical observations to be made; as for example with the perimeter. In this way symptoms of a localizing value may be brought to light which under the conditions of increased tension could not be elicited. Increased visual acuity and widening of the visual fields have been observed.

SUMMARY

1. In the human subject intravenous injection of hypertonic salt solution or the ingestion of salt produces a fall of cerebrospinal fluid pressure and a diminution of brain bulk.

2. In conditions of pathologically increased tension the response is conditioned by the details of the pathological alterations. The determining factors appear to be the size of the lesion which increases brain bulk and the amount of fluid available for absorption. The induced fall of pressure is inversely proportionate to the former and directly proportionate to the latter.

3. A distinction is made between increased intracranial fluid tension *per se* and increased intracranial tension which is due to enlargement of brain bulk.

4. From observations of cases of obstructed and dilated ventricles an intraventricular absorption of fluid following salt ingestion seems to occur.

5. The procedure has a definite field of clinical usefulness in cases exhibiting high grades of intracranial pressure. The most striking results are to be obtained in those cases in which cerebrospinal fluid obstruction exists.

Acknowledgment is made of Dr. Cushing's stimulus in this study and my thanks are due him for the opportunity to carry out the observations on patients.

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EARLY SQUAMOUS-CELL CARCINOMA OF THE CERVIX

Accidentally Discovered When the Body of the Uterus was being Curetted for Hæmorrhage Caused by Hyperplasia of the Endometrium and by a Small Submucous Myoma[1]

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IN December, 1918, I saw a patient who had been suffering from very long and profuse periods. Examination of scrapings from the body of the uterus demonstrated that the excessive flow was due in part to a hyperplasia of the endometrium. To our surprise there was also a very early squamous-cell carcinoma of the cervix, too early to give clinical manifestations. Early cell changes are always interesting and this case, detected just after the carcinoma had started, is well worth describing in detail.

On April 26, 1915, I saw Miss H., age 46, in consultation with Dr. Lewellys F. Barker. The patient had commenced to menstruate at 14, had been irregular at the beginning and when the first period started she was having an attack of scarlet fever. The periods had been regular for 15 years, very free, lasting 5 days and sometimes 6 or 7 days. As a rule there had been no discharge between periods, but 5 years before I saw her she had noted a slight brownish or bloody discharge between periods for a time.

From the history we learned that in the summer of 1913 some small polypi were removed.

December 21, 1918. This patient came to see me a few days ago. For the last 15 months the periods have been increasing in frequency, have been irregular, and as a rule there has been an interval of from 2 to 10 days between them.

On examination I found the uterus nearly normal in size. There was a slight unevenness on the surface of the fundus. I curetted thoroughly and on examination of the scrapings (Gyn.-Path. No. 24,560), found definite gland hyperplasia (Fig 1). In one corner of the specimen was a small area of typical squamous-cell carcinoma. I was amazed beyond measure at finding the carcinoma and as there was only one small piece giving any evidence of malignancy I thought there might possibly have been some mistake. Fortunately this was the only curetting that we had during that week, consequently the chance of error was absolutely ruled out. We were not satisfied, however, and curetted again on December 28, 1918. The second scraping yielded a most beautiful example of early proliferation of the epithelium associated with the development of a squamous-cell carcinoma. In fact, it is the earliest case of squamous-cell carcinoma of the cervix that I have ever seen. The bleeding was undoubtedly due to the hyperplasia and to the small submucous myoma, and the finding of the carcinoma was one of those fortunate coincidences that will occasionally occur where the routine microscopical examination of scrapings is undertaken.

Operation, January 3, 1919. We did a complete Wertheim operation. It was rather difficult on account of the depth of the pelvis. The descending colon had grown fast to the broad ligament; this was loosened. We then opened up the left broad ligament, tied off the ovarian vessels, cut the bladder peritoneum and exposed the left ureter. The same thing was done on the right side. We cut the uterosacral ligaments on both sides early and got very good exposure. The uterus was removed without difficulty. Two drains were laid in the pelvis and brought out through the vagina. One was left in the abdominal wall down to the muscle. We

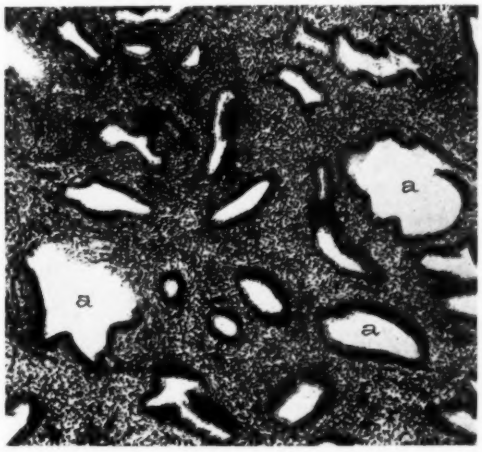

Fig. 1. Moderate hyperplasia of the endometrium. (Gyn.-Path. No. 24,560.) The mucosa in places looks perfectly normal. At other points, as indicated by *a*, the glands are much larger than normal. This increase in size is not due to any obstruction, as the glands are not spherical. The stroma in some places is rather dense. The picture is that of a moderate gland hyperplasia—a condition invariably accompanied by very profuse menstrual periods.

[1] Read before the meeting of the Texas State Section, Clinical Congress of American College of Surgeons, Dallas, January 8, 1921.

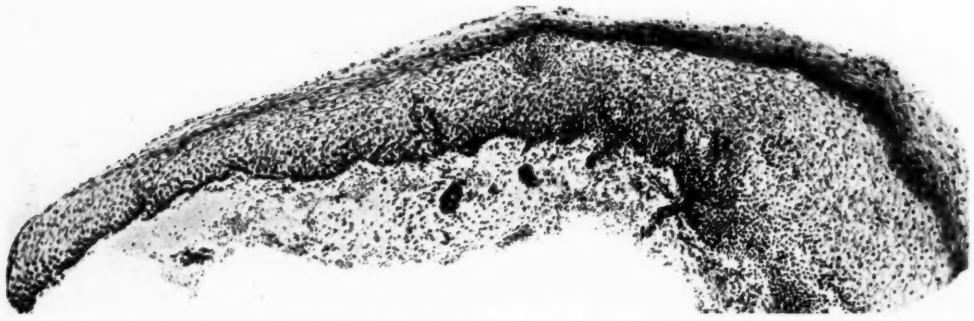

Fig. 2. Thickened squamous epithelium from the vaginal portion of the cervix. (Gyn.-Path. No. 24,560.) At the left of the picture the squamous epithelium is of normal thickness, but as we pass to the right it gradually increases in thickness and at the extreme right is fully three times as thick as normal. That this appearance is not due to the epithelium being cut on the bevel is definitely proved by the picture shown in Figure 3.

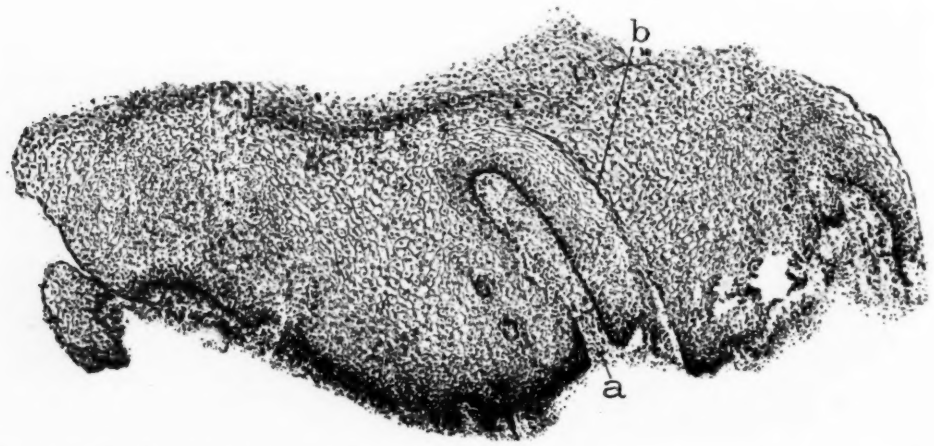

Fig. 3. Proliferation of the squamous epithelium in an early squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) The epithelium is at least three times the normal thickness. At *a* is a papilla. This is fully twice as long as usual and is evidently pushing outward, as is clearly indicated by the sharp line of differentiation between its surrounding epithelium and that in the neighborhood. This is remarkably well shown at *b*. This picture clearly indicates how the finger-like processes so frequently noted on the surfaces of squamous-cell carcinoma of the cervix develop.

removed the appendix which was tied down in its middle portion. The patient stood the operation well, but made a slow recovery on account of a marked thyroid condition.

On opening the uterus (Fig. 14), I found a submucous myoma 1.5 centimeters long. Near the internal os was a small papillary growth 9 millimeters long, 3 millimeters broad.

In 1900 I described two cases of hyperplasia of the endometrium.[1] At that time we had not given this definite pathological lesion a name. It was referred to in detail in my *Adenomyoma of the Uterus*[2] in 1908. Since then we have observed many cases and the subject has been fully considered by Dr. Emil Novak[3] and others.

Although hyperplasia may occur in girls in their teens it is usually noticed during the

[1]Thomas S. Cullen. Cancer of the Uterus, 1900 ,p. 479.

[2]Thomas S. Cullen. Adenomyoma of the Uterus, 1908, p. 180.

[3]Emil Novak. Hyperplasia of the endometrium. Am. J. Obst. 1917, lxxv, 996.

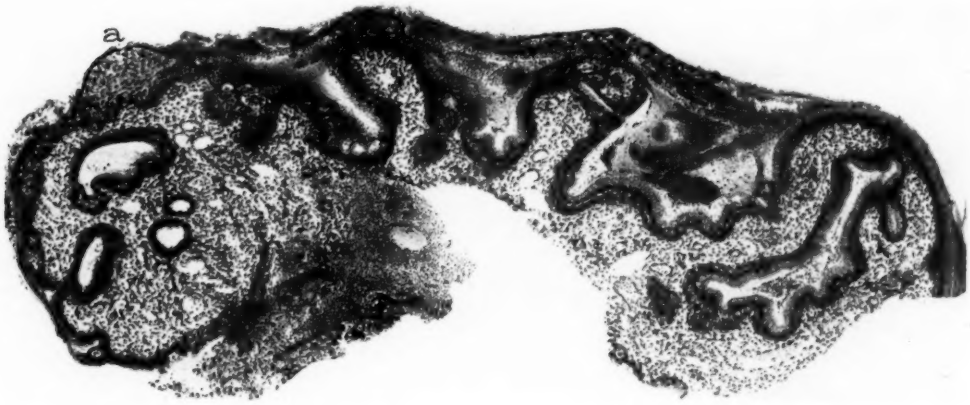

Fig. 4 Proliferation of the surface epithelium in a case of very early squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) Nearly the entire tissue consists of normal cervical mucosa with its characteristic high cylindrical epithelium. At *a* is a proliferation of epithelial cells looking like squamous epithelium. From the location one would naturally infer that it was the cylindrical epithelium which had proliferated, but we all know that as a rule, where cylindrical epithelium proliferates, new glands are formed. From our histological studies we know that squamous epithelium at times extends far up into the cervical canal and in such cases the glands must of necessity open directly onto squamous epithelium. Whatever the explanation may be, we have in this picture a proliferation of epithelium with the formation of a solid mass of epithelial cells. For other views of this mass of epithelial cells, see Figures, 5 and 6 at *a*.

Fig 5. Localized proliferation of epithelium in a very early squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) At *a* is the localized outgrowth of what appears to be squamous epithelium. See also Figures 4 and 6 at *a*.

childbearing period. The most prominent symptom is an excessive menstrual flow.

The very free flow in the case under discussion was due in part to the moderate degree of hyperplasia noted in Figure 1, in part to the submucous myoma (Fig. 14). There was no intermenstrual discharge, when she came under my care.

When we turn to the carcinoma of the cervix we find that the squamous epithelium which at some points is perfectly normal, gradually increases in amount until it is three

Fig. 6. Localized outgrowth of cervical surface epithelium in a case of early squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) At *a* is a localized proliferation of epithelium resembling that of the squamous-cell type. See also Figures 4 and 5 at *a*.

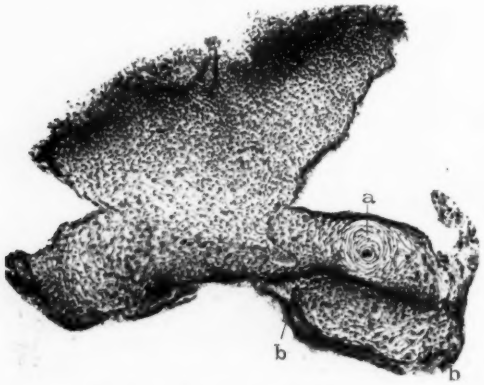

Fig. 7. The formation of an epithelial pearl in a case of very early squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) The squamous epithelium apart from its thickness is little altered. At *a* is a very young epithelial pearl. In the area *b* the epithelium is a little irregular and wavy. I have never seen an epithelial pearl in the squamous epithelium of the cervix except where cancer existed. Horny epithelium is now and then noted where prolapsus is present. In such cases the exposed cervix is naturally subjected to considerable irritation. Our patient was an unmarried woman. The cervix was in its normal position, and there was no evidence of any inflammatory reaction. Not a single polymorphonuclear leucocyte is to be seen in the field.

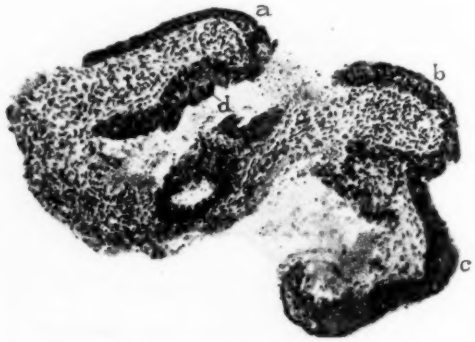

Fig. 10. Young finger-like processes in an early squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) *a*, *b*, and *c* are early finger-like processes. Each is covered by several layers of deeply staining squamous epithelium. At *d* some of the epithelial nuclei are large, stain intensely, and at once indicate malignancy. For other finger-like processes see Figures 8 and 9.

or four times as thick as usual (Figs. 2 and 3). At other points the epithelial cells bear a rather confused relationship to one another; in other words, they present a rather jumbled-up appearance instead of preserving their usual orderly arrangement. (Fig. 7, *b*.) At one point we found a typical epithelial pearl (Fig. 7, *a*).

The cylindrical epithelium of the cervix presented the usual appearance, but at several points on the surface there were well defined aggregations of cells (Figs. 4, 5, and 6). These cells looked like masses of squamous epithelium. Their exact origin is rather difficult to explain but we know that in some cases the squamous epithelium extends up the cervical canal as far as the internal os. In such cases the cervical glands open

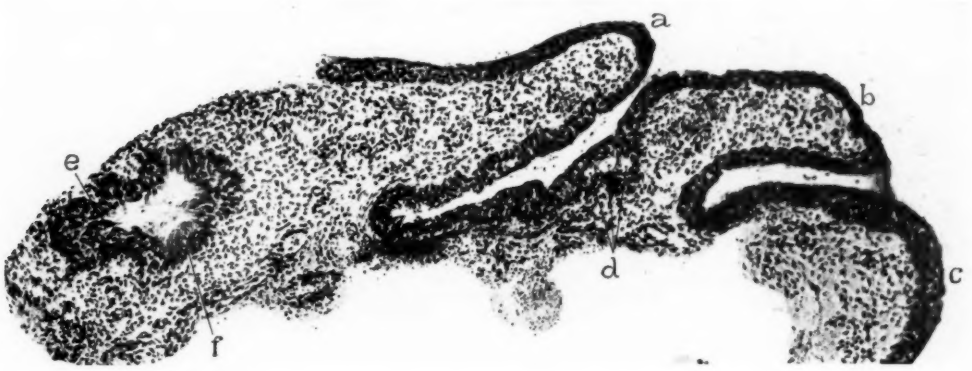

Fig. 8. Young finger-like processes in a very early squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) *a*, *b*, and c are finger-like processes of stroma covered over by several layers of altered squamous epithelial cells. The epithelial cells are more closely packed together than normal, and their nuclei stain deeply instead of being vesicular. At *d* are a few vacuoles in the epithelial layer. At *e* the nuclei of some of the epithelial cells are larger than those of the surrounding ones. At *f* is what appears to be the normal cylindrical epithelium of the cervix. For other finger-like processes see Figures 9 and 10.

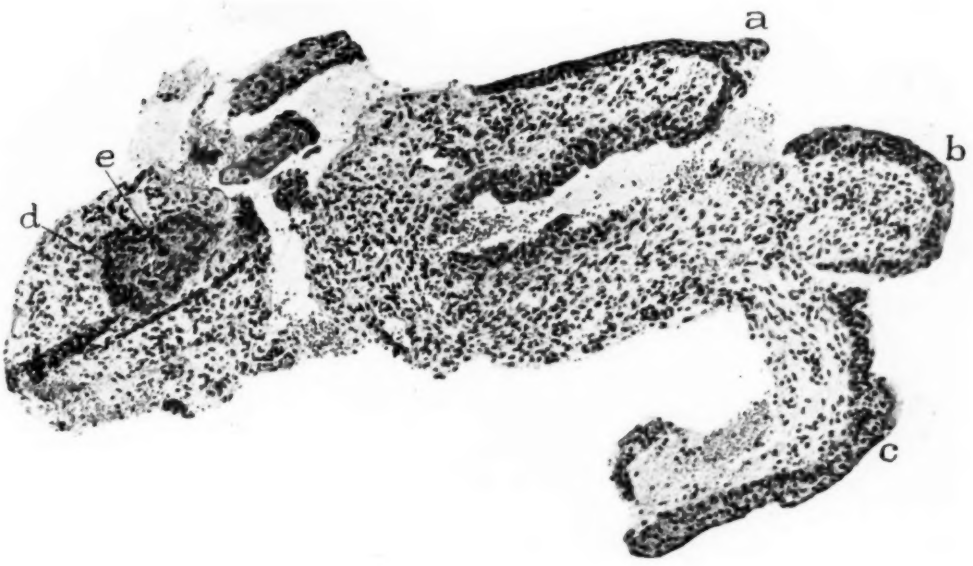

Fig. 9. Finger-like processes in an early squamous-cell carcinoma of the cervix. (Gyn.-Path. No.24,560.) *a*, *b*, and *c* are early finger-like processes covered over by altered squamous epithelium. At *d* is a cell nest and in the center of this is at least one large deeply staining nucleus, *e*. For other finger-like processes see Figures 8 and 10.

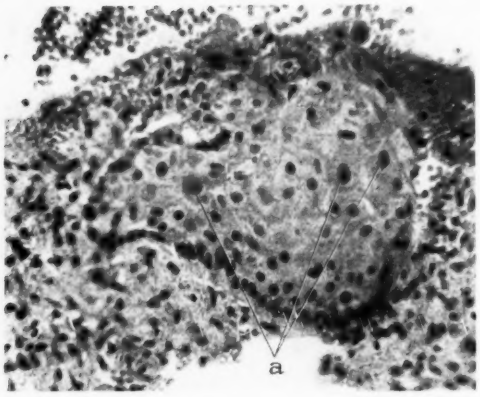

Fig. 11. A cell nest in a very early squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) Some of the nuclei of the epithelial cells composing this nest are, as indicated by *a*, much larger than others and at once suggest the possibility of malignancy. For other nests see Figures 12 and 13.

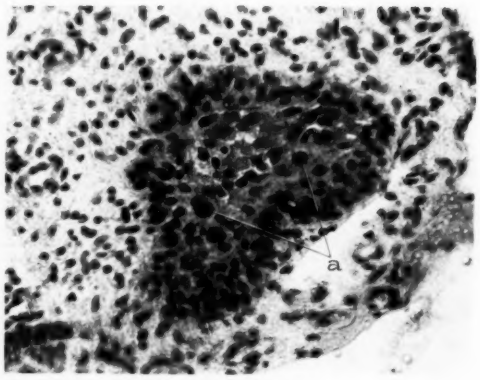

Fig. 12. A suspicious cell nest from a case of early squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) The cell nuclei stain darkly instead of being vesicular. Several of the nuclei are large and at once suggest malignancy. Those indicated by *a* are especially large. For other high power pictures see Figures 11 and 13.

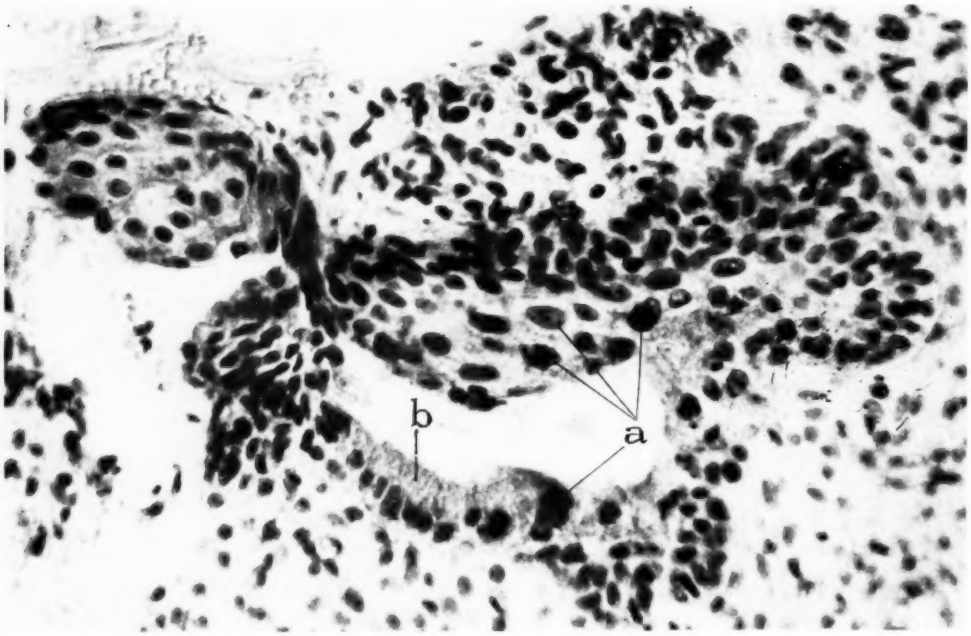

Fig. 13. Early cell changes in a squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) Many of the epithelial nuclei stain deeply. Those indicated by *a* are very large and suggest an active process. This picture is evidently taken just where squamous and cylindrical epithelium meet, as at *b* we find definite cylindrical cervical epithelium. For other cell changes see Figures 11 and 12.

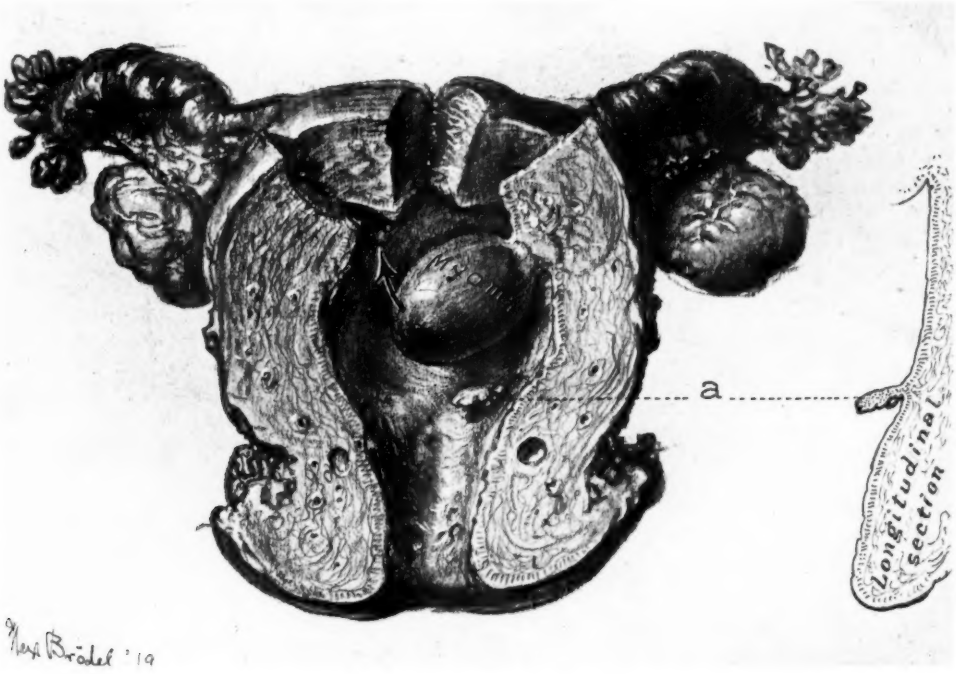

Fig. 14. Early squamous-cell carcinoma of the uterus. (Gyn.-Path. No. 24,587.) This is merely a rough sketch. The body of the uterus is a little larger than normal. Projecting into the cavity is a pedunculated submucous myoma. At *a* is all that remains of the small carcinoma that evidently started near the internal os. The length of the papillary process is indicated by the small sketch to the right. The remainder of the growth was brought away with the curette. The small myoma partially covered the papillary growth. It has been raised up as indicated by the arrow.

directly into a cavity lined with squamous epithelium.

From this case we learn much about the way in which the finger-like processes of squamous-cell carcinoma develop. The earliest stage is particularly well shown in Figure 3. Here a papilla has become fully twice as long as normal; that it is growing is clearly indicated by the line of demarcation *b*, between its surrounding epithelial cells and those of the adjoining epithelium. This finger-like process is already fairly well differentiated.

Most of the well-defined finger-like processes in this case are broad, have a well organized stroma and are covered over with squamous epithelium. This epithelium is several layers in thickness, stains very deeply and is markedly different from normal epithelium. Such finger-like processes are shown in Figures 8, 9, and 10.

Nests of altered epithelial cells are found scattered throughout the stroma in Figures 9, 11, and 12. With the low power, large, deeply staining epithelial nuclei are seen in Figure 8 at *e*, Figure 9 at *e*, and in Figure 10 at *d*. With the high power the variation in the sizes of the epithelial nuclei is well shown in Figures 11, 12, and 13.

The gross specimen is seen in Figure 14. In the cavity of the uterus is a small submucous myoma and the only remnant of the early squamous-cell carcinoma that evidently developed near the internal os is the small blunt papillary mass just above the internal os.

Some of the more skeptical might say that these findings, although suspicious, are not

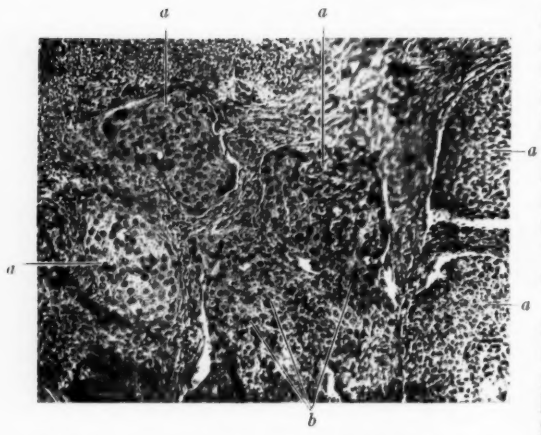

Fig. 15. Squamous-cell carcinoma of the cervix. (Gyn.-Path. No. 24,560.) The picture is that of a typical squamous-cell carcinoma of the cervix. Characteristic cell nests are to be seen at the points indicated by *a*. In some of the nests the cell nuclei are uniform in size, in others they vary much in diameter. At *b* are several large deeply staining nuclei. This is the cervical tissue that was brought away when the patient was being curetted for hyperplasia of the endometrium. The suspicious pictures noted in Figures 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 were obtained from cervical material removed at the second curettage.

conclusive of malignancy. My reply would be that we have never seen an epithelial pearl in the squamous epithelium of the cervix except in cases of squamous-cell carcinoma of this region, and further that we have never seen finger-like processes similar to those here shown except where squamous-cell carcinoma of the cervix existed. In this case, however, there is absolutely no room for doubt, as Figure 15 shows the most typical squamous-cell carcinoma that we could wish for. The arrangement of the cell nests and the individual cell changes are characteristic.

From the location of the carcinoma near the internal os it is probable that it would have advanced far before being detected, had it not been for the fortunate coexistence of the hyperplasia and the small submucous myoma. Such early cases teach us more than dozens of late ones, where the early changes are lost or destroyed in the widespread growth. It is to the early diagnosis of carcinoma of the cervix that we must look for future success.

There is no evidence of a return of the carcinoma in this case, and we are confident that the patient will have no further trouble from it.

I cannot let the opportunity pass without expressing my sincere appreciation of the excellent photomicrographs furnished to us by Mr. Herman Schapiro.

RARE TUMORS OF THE CERVIX OF THE UTERUS OF INFLAMMATORY ORIGIN—CONDYLOMA AND GRANULOMA[1]

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CONDYLOMA OF THE CERVIX

CONDYLOMA of the cervix is one of the rarest of gynecological disorders. The infrequency with which this condition occurs is indicated by the fact that in the past 30 years we have seen only three cases of this disease in the Johns Hopkins Hospital. The attention of the author was drawn to this subject by the fact that there recently came under his care a patient with this unusual condition and also by the fact that few of the visiting staff and none of the house men had ever seen a similar lesion before.

Its rarity is further reflected in that the literature for the past 20 years seems to contain no reports of any definite cases of gonorrhæl cervical condyloma and records less than a dozen cases of condyloma of all other types. In 1900 Cullen (2) reported in detail a case of condyloma of the cervix due to tuberculosis (Gyn. No. 6564) in connection with the differential diagnosis of carcinoma of the cervix. In 1907 Maley (3) gave a report of a similar case and was able to find only nine others of this type in the literature. He did not mention condyloma or papilloma of the cervix associated with gonorrhœa or any other condition. Kelly and Noble (4) state that condyloma acuminata may occur on the cervix but do not describe the lesion. They further state that tuberculosis of the cervix may assume the form of a "hyperplastic vegetative outgrowth which resembles a venereal wart or an early papillary carcinoma." Winter and Ruge (5) give an extremely brief discussion of acuminate condylomata in discussing the differential diagnosis of cervical tumors. Norris (6) states that cervical condylomata are extremely rare, are liable to occur during pregnancy,[1] may vary in shape, are often pedunculated and usually are secondary to gonorrhœal cervicitis. One would hardly expect, however, in textbooks which cover the whole field of gynecology to find lengthy treatises on lesions which are as unusual as this. It rather falls within the province of special articles to record these rarities, and for this reason, it has seemed to us worth while to report the cases which have come under our observation.

Condylomata are classed as typical lepidic growths, coming under the group of papillomata. Adami (7) describes them as "outgrowths from surfaces presenting a covering layer of epithelium, whether squamous or columnar, having a more or less pronounced connective-tissue core to each individual process." Such tumors are common on the external genitalia, the perineum, or around the rectum, particularly in association with gonorrhœa or syphilis. Patients with such lesions almost always give the history of having had a profuse and irritating vaginal discharge. Such tumors are altogether benign, and if seen early will usually clear up entirely if the source of the irritation is removed. Appearing at first as small, isolated papules or papillomata on the external genitalia or the perineum, they often attain large size, coalesce and eventually form a large cauliflower growth entirely covering the labia, surrounding the urethra, breaking down in places to form excavated ulcers,—in all forming an extremely repulsive and yet serious therapeutic problem. This type of lesion is so common that every gynecologist is acquainted with its characteristics.

The cervical type of condyloma is as rare as the vulval type is common. When compared in frequency with epithelioma of the cervix, it occurs in the ratio of less than one to three hundred, for, during the period in which we have observed three cases of cervical condyloma, we have treated in the hospital about seven hundred cases of carcin-

[1] Cullen tells me he saw a case in which there were three or four small condylomata on the posterior lip of the cervix, associated with early pregnancy.

[1] From the Department of Gynecology of the Johns Hopkins Hospital and University.

oma of the cervix and have observed many others too far advanced for any form of curative therapy. Because of its extreme rarity, it has drawn scant attention in the literature and we are, therefore, compelled to turn in the main to our own material for a description of the lesion.

Etiology. Of our three cases, two were gonorrhœal and one was tuberculous. In one case (Gyn. No. 9454) the lesion was of the classic textbook type, there being a single pedunculated condyloma situated on the posterior lip of the cervix, accompanied by a cauliflower-like mass of condylomata acuminata which covered the external genitalia and perineum. The second gonorrhœal case (Gyn. No. 25625) presented the characteristic history with the typical pelvic lesions of an old Neisser infection of long duration. The patient was a negress, 25 years old, who had been sterile since a pregnancy which had occurred at the age of 15. At the time of her admission to the hospital in January, 1920, she had a tubo-ovarian abscess, chronic salpingitis, encysted pelvic peritonitis and a massive granulomatous growth on the cervix. In our case of tuberculous condyloma, the diagnosis was established by the pathological examination of the tissue removed at operation. Syphilis seemed to play no part in these cases, as neither the history nor the clinical findings indicated the presence of this disease in any of these patients. Two of these patients were observed before the days of the Wassermann reaction; the third (Gyn. No. 25625) gave a negative result in the blood on two separate examinations. In one of our three cases, the condylomata developed very soon after a pregnancy. It has always been stated that gonorrhœal condylomata are particularly liable to be associated with or follow pregnancies. In our experience, then, it seems that gonorrhœa and tuberculosis are the etiological factors in the production of cervical condyloma.

Pathology. Condylomata are benign, inflammatory tumors, consisting of papillary growths of which the essential constituents are a connective-tissue core covered by the same type of epithelium which is present on the surface from which they spring. Both the connective tissue and the epithelial elements in condylomata may undergo secondary changes due to trauma, infection, or any such factors. Malignant transformations have never been observed by us. Cervical condylomata are covered either by squamous or cylindrical epithelium, depending upon the portion of the cervix from which they arise. There being no horny layer in normal cervical epithelium, one would not expect to find that layer present in cervical condylomata under ordinary conditions.

Because of the scarcity of material, it is impossible to generalize too broadly on the pathology. Furthermore, since each of our cases presented a different picture both in the gross and microscopic characteristics, we shall be compelled to consider each type individually. Of our two cases of gonorrhœal condyloma, one was a solitary pedunculated papilloma consisting of a core of loose fibrous tissue covered by normal intact squamous cervical epithelium. There was a very mild grade of chronic inflammatory reaction in the connective tissue of the growth. In the other instance, as is shown in the accompanying drawing (Fig. 1), almost the entire cervix was replaced by a cluster of blunt papillomata each about 4 to 6 millimeters in diameter and varying in height from 1 to 1.5 centimeters. These individual processes were rounded, purplish-red, not ulcerated, very soft, offering almost no resistance to the examining finger, lying closely crowded together over the vaginal portion of the cervix, forming a striking contrast with the narrow strip of white, squamous epithelium which covered the unaffected area on the posterior lip of the cervix. The cervical canal itself was not involved in these growths. These papillomata were extremely superficial, the firm tissue of the cervix being felt very clearly through the soft mass. The body of the cervix itself was quite normal except for a low grade inflammatory reaction and a rather marked hypertrophy.

When viewed under the microscope (Fig. 2), it is seen that these granulomatous tufts were entirely devoid of true epithelium. The squamous epithelium of the cervix came to a sharp and normal termination just at the

border of the inflammatory mass and there was no trace of any epithelium over the papillomata. They were covered, however, by a delicate layer of fibrin and coagulated exudate such as would be found in a true erosion of the cervix. The stroma of these tufts presented a most acute grade of inflammatory reaction and throughout it were scattered numerous cervical glands with their high cylindrical epithelium. In this case, as Novak suggests, it may be that these granulomatous tufts represented the late stage of a true cervical erosion with unusual inflammatory proliferation. Whatever may have been the mode of development of these growths, both in the gross and microscopic examination, they presented an extremely unusual and almost unique picture. As in Maley's case of tuberculous condyloma and in this case of gonorrhœal granuloma, the outgrowth probably had its origin in the area of the cervix that was covered by cylindrical epithelium, and as these masses grew the squamous epithelium of the cervix seemed to recede before their advance.

The character of the stroma of the gonorrhœal condylomata varies with the grade of inflammatory reaction present. In the typical picture there is a fibrous core which is continuous with the underlying connective tissue and which weaves its way up into the various condylomatous tufts. This was the type of stroma in one of our cases (Gyn. No. 9454). In this instance the inflammatory reaction was of a very low grade. In the other case (Gyn. No. 25625) there was a very acute inflammatory reaction. The granulomatous tufts consisted of almost nothing but acute inflammatory tissue, packed with leucocytes, markedly vascular, with almost no evidence of organization (Fig. 2). Throughout the inflammatory tissue underlying these papillomata were scattered normal cervical glands. There was also a marked endocervicitis. The severe grade of inflammatory reaction present is shown clearly in the accompanying drawing.

Tuberculous condyloma of the cervix has been studied especially by Kaufman and Maley. According to Kaufman, tuberculosis of the cervix may take three forms: miliary, ulcerative, or papillary. Maley states that the papillary or condylomatous type is by far the rarest of these. He was able to find only nine cases that had been reported in the literature before 1907. Fortunately, in reporting his own case, he made a careful pathological study, the records of which agree with ours in all important considerations.

Fig. 1. Condyloma of the cervix, gonorrhœal. Gyn. No. 25625. Gyn. Path. No. 25662. The raised, soft, papular growth on the hypertrophied cervix is clearly shown. There is a small cluster on the right vaginal margin where the growth has extended beyond the cervix. The small fibromata on the labium majus to the right of the urethra have no connection with the condyloma. At first glance one might call this cervical tumor a papillary carcinoma.

In the gross, tuberculous condyloma is usually accompanied by marked hypertrophy of the cervix. In Maley's case the virginal cervix was "as large as a small apple." In our case, the cervix and its papillomata filled the upper third of the vagina. The gross characteristics of such a tumor are rather unusual on palpation. One feels a large, soft, smoothly lobulated mass which seems to replace the cervix completely. It is not

Fig. 2. Condyloma of the cervix, gonorrhœal. Gyn. No. 25625. Gyn. Path, No. 25662. This illustration gives the microscopic picture of a section of the tumor shown in Figure 1. The field shows the border of one of the condylomata. The normal squamous epithelium of the cervix is seen to disappear gradually, being undermined by the inflammatory mass which consists of dilated blood vessels, leucocytes of both mononuclear and polymorphonuclear types, and fibroblasts. The epithelium over the condyloma has disappeared. There are no glands in this field but in other condylomatous tufts immediately adjacent are numerous cervical glands which show no significant pathological alterations. It is a benign inflammatory tumor.

very tender, might bleed slightly on manipulation, but the superficial growth is not friable and does not break off or give way under pressure as does carcinoma. The base of the growth does not present the firmness which is characteristic of carcinoma. It feels more like a sarcoma,—in fact, this was the diagnosis which Maley made in his case.

When viewed with the speculum the cervix is obliterated by lobulated masses which "look like exuberent granulation tissue, filling a cavity left by an operation" (Fig. 3). Occasionally clear cysts (dilated cervical glands) can be seen in these masses. If one attempts to curette away this mass, he is immediately convinced that he is probably not dealing with carcinoma because the tissue will not break off, there is no necrotic surface, and the curette hangs in tags of tough granulations.

On microscopic examination in Maley's case, these lobulated masses were covered by intact cylindrical epithelium. The pathology of our case was studied carefully by Cullen, who reported it in detail in his book on *Cancer of the Uterus*. The polypi were covered by many layers of squamous epithelium which was normal except for a slight leucocytic infiltration. The ducts of the cervical glands coursed down through a mass of tuberculous granulation tissue which was about 1.5 centimeter in thickness. The glands were normal. The inflammatory reaction was sharply marked off at the base of the granuloma.

It usually surprises the operator to discover how superficial these tuberculous condylomata are. Maley expected to find a sarcoma and did a panhysterectomy only to discover that the cervical growth was but 1 centimeter in depth. In our case (Gyn. No. 6564) the operator thought it would be necessary to perform a vaginal panhysterectomy, but on closer inspection found that the entire growth could be removed by a low amputation of the cervix.

Endometritis and condyloma. Until recent years the term endometritis has been used

to cover a multitude of gynecological complaints without any reference to its exact significance. We are using the word here in its accurate and pathological sense, meaning a true inflammatory lesion of the endometrium. When given this definition, endometritis at once becomes a much less common clinical entity than it was formerly supposed to be. These cases of gonorrhœal condyloma and granuloma demonstrate how resistant the endometrium of the non-pregnant uterus is to gonorrhœal infection. Although this fact has been known for years, it has not yet been appreciated by the medical profession. One has but to read over the current literature, the questions asked in State Board examinations or engage in conversation with the average practitioner to be assured of the fact that endometritis is still supposed to be one of the commonest of gynecological diseases and that curettage of the uterus is and always has been the panacea for all pelvic diseases. In 1898, Cullen reported before the Medical and Chirugical Faculty of Maryland that, in the examination of the tissue removed in eighteen hundred consecutive gynecological operations in the Johns Hopkins Hospital, he had observed real endometritis only forty-nine times. This series included all the hysterectomies and curettages, irrespective of the operative indication. He was one of the first to draw attention to the loose use of the word endometritis. This observation was later reported in the *Maryland Medical Journal*. It is with pleasure that we read such articles as those by Curtis (1) and Bovée (8) who in the last few months have again presented evidence in support of the opinion that endometritis is not commonly found in connection with gonorrhœa and that curettage of the uterus should be performed only with the strictest asepsis and under the most clear-cut indication.

In the light of modern conceptions as to the method of progress of a gonorrhœal infection in the female pelvic organs, it is hard to conceive how conditions could be more ideally suited for the development of endometritis than in the presence of endocervicitis and condyloma of the cervix, especially when these lesions are accompanied by bilateral pyosalpinx. In our two cases of gonorrhœal condyloma of the cervix, however, we found neither clinical nor pathological evidence of endometritis. In one instance the infection had caused gross lesions in the cervix, both fallopian tubes and ovaries, and yet the endometrium was unaffected. Although this patient had a bilateral tubo-ovarian abcess, chronic endocervicitis, and a massive and heavily infected condyloma of the cervix, the microscopic examination of the endometrium showed that it was normal. The offensive discharge was not in the least affected, moreover, by the supravaginal hysterectomy; it was not until the cervical growth was destroyed by the actual cautery that the leucorrhœa disappeared.

Fig. 3. Tuberculous condyloma of the cervix. Gyn. No. 6554. Gyn. Path. No. 2805. The illustration shows the lobulated, exuberant growth with the massive hypertrophy of the cervix. It has not invaded the vaginal mucosa, but has wholly replaced the superficial portion of the cervix. Both on palpation and visual examination, this tumor would be difficult to differentiate from carcinoma of the cervix.

In tuberculous condyloma, the reverse seems to be the rule. In our case, the cervical lesion was accompanied by advanced tuberculous endometritis and also by a generalized dissemination of the infection involving both fallopian tubes, the spleen, kidneys, liver, intestines, retroperitoneal glands, lungs, pleura, and the brain. In Maley's case also, the endometrium was involved.

It seems, then, that the endometrium is not usually involved in connection with gonorrhœal condylomata of the cervix, even though there might be lesions in both fallopian tubes. In the case of tuberculous condyloma of the cervix, however, the cervical involvement is often merely the local manifestation of an infection, the lesions of which may be so generalized as to be at times systemic.

Symptoms. The most constant symptom referable to cervical condyloma is leucorrhœa. This was the chief complaint of all of our patients. The discharge is purulent, profuse, may have a bad odor, but has not the characteristic stench found in carcinoma of the cervix. At times the discharge may be blood-tinged, especially after coitus. In gonorrhœal condyloma, the symptoms due to salpingitis and its complications may be prominent, causing menstrual irregularities and abdominal pain. Similarly, in tuberculous condyloma, the history in a given case depends upon the extent of the associated lesions. In both types, the history may not be at all unlike that of early carcinoma of the cervix.

DIAGNOSIS

Condyloma of the cervix must be differentiated from all conditions which would cause a profuse and bloody vaginal discharge, —carcinoma, cervical polypi with infection, sarcoma, benign inflammatory hypertrophy with deep lacerations, etc. The history might be of help in this regard but all patients who complain of a bloody vaginal discharge must be subjected to a rigid examination. On bimanual palpation, condylomata are not so firm, are not friable, do not bleed so profusely on manipulation, do not have the cartilaginous base and the easily broken down necrotic surface, and are not associated with the foul sickening discharge which characterizes advanced carcinoma of the cervix. It is with early carcinoma that they are more liable to be confused. On inspection tuberculous condylomata are smooth, lobulated, purplish-red, may present clear cystic areas due to enlarged cervical glands,—a picture not usually seen in carcinoma. In gonorrhœal condyloma the tufts may be of the granuloma type, consisting of small red papillomata, smooth, glistening, very soft and insensitive; or they may consist of isolated pedunculated acuminate growths resembling those which are found on the perineum, except that the cervical condylomata are pink or purplish-red, are soft and will usually bleed on manipulation.

As in the case of all cervical growths, the ultimate diagnosis should be made on the basis of a microscopic examination of the tissue itself. Even when there seems to be no room for clinical uncertainty, habit and routine should impose this invaluable laboratory check. In two of our cases, the diagnosis could not be established without the aid of the microscope. Maley diagnosed his case a sarcoma before he saw the microscopic sections. We repeat, therefore, that it is essential to have the clinical opinion confirmed by microscopic examination of the tissue removed.

TREATMENT

In the treatment of gonorrhœal condylomata, it is necessary to remove the source of the irritation and infection and also to destroy or remove the local growth. It has been our experience that neither one of these measures is sufficient in itself—both are necessary. Thus, in the case of the patient with the massive cervical condylomata, the main focus of the infection was removed by extirpating the tubal and ovarian abscesses, and at the same time a supravaginal hysterectomy was done. But this radical procedure in itself had no effect whatever in removing or checking the development of the condylomata. It was not until the cervical canal was thoroughly cauterized and the growths were destroyed by this same means that they disappeared and the offensive discharge ceased.

Should there be no lesions in the uterus or the fallopian tubes, the cervical growth can be removed by incision or cauterization. Curettage of the uterus should not be done in the presence of condyloma, as it might merely give rise to an endometritis which would otherwise not usually occur.

The treatment of tuberculous condyloma is usually a more serious problem as the cervix is quite resistant to tuberculous infection and an advanced lesion in the cervix is apt to be secondary to active manifestations of the disease elsewhere. As such, it is the least important localization of a widespread infection. It is, therefore, advisable in these cases to proceed slowly and with sound indication. We see no reason, however, why local treatments such as cauterization which do not require an anæsthetic should not be carried out. We would prefer to remove or destroy such growths by means of the actual cautery rather than by excision with the knife, as the cautery opens up no blood channels and does not tend to disseminate the infection. The only case of tuberculous condyloma we have seen died of generalized tuberculosis following an excision of the infected cervix.

PROGNOSIS

In gonorrhœal condyloma, the disease should not recur if the source of the irritation and the local growth are removed. In tuberculous cases, the prognosis depends entirely upon the nature of concomitant lesions which may be present. If handled with the proper precautions, the local condition in itself is not serious.

CASE REPORTS

CASE 1. Gyn. No. 25625. C. T., colored, single, age 25, admitted January 12, 1920. Diagnosis: Chronic pelvic inflammatory disease; tubo-ovarian abscess, right; condyloma of the cervix. Complaint: Pain in the lower abdomen, leucorrhœa. The family history is negative. The present illness dates from April, 1919. At that time the patient noticed that she had a certain amount of bleeding after coitus. Soon afterward she developed a profuse yellow vaginal discharge which had a bad odor but was not irritating. In July, 1919, she commenced to have sharp, cramp-like pains in the lower abdomen, located chiefly on the right side, radiating across to the left iliac fossa and into the right lumbar region.

The menstrual history is negative. The marital history is somewhat suggestive in that the patient at the age of 15, gave birth to an apparently normal child. Although she states that there were no complications during the puerperium, the absolute sterility which followed this pregnancy and the presence of an old pelvic inflammatory disease suggest that her infection might possibly date back to this puerperium.

Physical examination. Temperature, 100.4° F.; pulse, 106; respiration, 22. Wassermann reaction in blood, negative. White blood cells 11,200, hæmoglobin 70 per cent (Sahli). Blood pressure—115 systolic, 100 diastolic (tycos, auscultation). Urine, negative.

The general condition of the patient was excellent. The only abnormalities of note related to the gynecological condition. There was slight abdominal tenderness which was localized in the lower right iliac fossa, and which was not accompanied by rigidity, muscle spasm, or free fluid. There was no palpable abdominal mass. On pelvic examination the external genitalia were normal. There were a few fibromata mollusca which were scattered over the labia, the thighs and the groin. Bartholin's and Skene's glands were not involved palpably. The perineum was not relaxed significantly. The vaginal mucosa was normal. There was a profuse, thick, yellow discharge. The cervix was markedly hypertrophied, measured 7 centimeters across, was patulous and with the exception of a narrow strip on the posterior border was distinctly softened superficially, feeling very much like a piece of thick velvet. No discrete nodules could be felt. The posterior fifth of the cervix was normally firm and smooth (Fig. 1). The cervix did not bleed on light manipulation. The fundus of the uterus was pushed into the left fornix by a hard mass which filled the right half of the pelvis, was tense, moderately sensitive and densely adherent.

Rectal examination was negative.

On inspection the cervix presented a striking and unusual appearance. The posterior fifth of the cervix was white, showing the smooth, glistening surface of normal cervical tissue. The remainder of the cervix was replaced by a red polypoid mass consisting of numerous vascular papillomata, closely crowded together, raised about 1 centimeter over the strip of normal cervix, not ulcerated, with sharp borders both at the vaginal mucosa and on the posterior lip of the cervix (Fig. 1). Some of these papillomata presented little yellow crests consisting of purulent material which could be expressed with ease.

When palpated under vision, these papillomata were very soft, were not friable, would not break off, but would bleed on being rubbed as would a granulating wound. There was no tendency toward necrosis, sloughing, ulceration, caseation, or invasion. The cervical canal was not invaded by these papillomata and only on the right vaginal border had the process shown any tendency to pass beyond

the cervix. There were no secondary implantations or nodules in the vaginal mucosa.

Treatment. A small wedge of this tissue was removed for diagnostic purposes and the tubo-ovarian abscess was drained *per vaginam*. The convalescence was uneventful. Since the microscopic examination showed that the tissue was not malignant, the supravaginal portion of the uterus, both tubes and ovaries and the appendix were removed by laparotomy two weeks later. The patient left the hospital on February 18, entirely relieved of all her abdominal symptoms but still complaining of a profuse and purulent vaginal discharge.

She was then observed in the dispensary for a period of 2 months. During this time she used hot douches, general tonics, and was given local treatments without avail. The discharge increased in amount and occasionally was very bloody. On April 28, 1920, she was, therefore, readmitted to the hospital for the treatment of the cervical growth. It was then found that the condyloma had not changed in any particular under 2 months medicinal treatment. It, therefore, was destroyed with the actual cautery. Since that time the discharge has ceased absolutely.

Pathological diagnosis (No. 25662). Bilateral chronic salpingitis; tubo-ovarian abscess, right; acute oophoritis; normal endometrium; multiple condylomata of cervix, acutely infected.

CASE 2. This case was reported in 1900 by Cullen in his volume on *Cancer of the Uterus*. At that time he stated that this was the only case of cervical condyloma of this type that had been seen in this hospital. This statement still holds true. To make the present series complete we shall include a short abstract of this case.

Gyn. No. 6564. B. B., colored; aged 17; admitted to hospital December 13, 1898; operated upon December 21, 1898; died January 22, 1899; Autopsy No. 1257; Pathological No. 2805. Clinical diagnosis: condyloma of cervix, tuberculous. Complaint: leucorrhœa; pain in lower abdomen and back.

The present illness was of 1 year's duration. The first symptom was a white malodorous vaginal discharge. Two months later the patient had an attack of fever which lasted for 2 or 3 weeks and was accompanied by pain in the back and lower abdomen, headache and thoracic pain, but no cough. The onset of menstruation occurred at the age of thirteen following which for 3 years the menses were quite normal in every respect. Since the onset of the present illness one year ago, the patient has had complete amenorrhœa. The patient has never been pregnant.

Physical Examination: The patient, a young colored girl, appeared fairly well nourished. The only positive findings were the signs of old tuberculosis lesions at the apices of both lungs, an evening pyrexia of 100°–101° F., and the striking pelvic abnormality. The cervix was replaced by a large lobulated mass which filled the upper third of the vagina. This mass was resistant but did not have the superficial friability of a squamous-celled carcinoma or the cartilaginous induration of an adenocarcinoma. It did not bleed on light manipulation (Fig. 3). Dr. Howard A. Kelly who operated upon this patient made the note that this growth looked "like an exuberant cockscomb, pinkish, with shallow sulci between the lobules." He also observed that in places the cervical glands were dilated and had the appearance of clear cysts which presented on the surface of the lobules. The picture as a whole reminded him of "exuberant granulation tissue which was filling a cavity left by an operation." The microscopic picture is described by Cullen in his volume on *Cancer of the Uterus*, page 195.

Operation. Under general anæsthetic, an attempt was made to curette away this mass. The curette, however, would hang in the resistant tissue leaving tags attached to the cervix and bringing away almost no material. An amputation of the cervix was therefore done.

During the first week after the operation, the convalescence was uneventful. The patient then commenced to have an evening rise of the temperature, symptoms of generalized tuberculosis set in and her decline was steady. She died on the thirty-second day after the operation.

The postmortem examination (Autopsy No. 1257) revealed the fact that the patient died of generalized tuberculosis which involved the endometrium, both fallopian tubes, the liver, spleen, kidneys, intestines, the retroperitoneal glands, the lungs, and brain. The lesion in the lungs consisted of an acute tuberculous pneumonia. The cervical growth was a massive tuberculous condyloma.

CASE 3. Gyn. No. 9454. C. M., white, aged 36. Diagnosis: Condyloma of vulva, massive; condyloma of vagina and cervix. Admitted to hospital March 9, 1902; operated upon March 17, 1902; discharged from hospital April 10, 1902.

The patient entered the hospital complaining of leucorrhœa and a growth on the genitalia. For 4 or 5 years she had had a rather profuse white vaginal discharge which had become extremely irritating and offensive, especially since the birth of her last child in 1900. One year later the patient developed vulval condylomata which were removed but recurred promptly and had been growing rapidly during the year which preceded her admission to this hospital.

The patient had given birth to five children, all the labors and puerperia having been normal. Her menstrual history was practically negative with the exception that during the past year the menses had been becoming increasingly profuse and had been coming with greater frequency than normal. There had been no intermenstrual bleeding.

Examination showed that the perineum was covered by a massive vegetative condyloma which had involved all the external genitalia, the urethra, and the introitus. All normal landmarks had been

obliterated. There were a few condylomata scattered over the vaginal mucosa and a pedunculated mass was attached to the posterior lip of the cervix. The cervix itself was markedly hypertrophied and rather deeply lacerated. The fundus lay in retroposition. The fallopian tubes and ovaries were normal.

At the operation the condylomata were all excised, including the condyloma of the cervix. The convalescence was uneventful. The microscopic examination of the cervical growth showed that it was covered by squamous epithelium, the stroma was somewhat infiltrated by mononuclear leucocytes, and in the area beneath the growth there was a moderate grade of chronic inflammation.

CONCLUSIONS

1. Condyloma of the cervix is one of the rarest of gynecological disorders.

2. Etiologically, pathologically, and clinically, there are two distinct types of condyloma of the cervix: the gonorrhœal and the tuberculous. When complications are not present, the symptomatology in these two types may be identical, the chief complaint being the presence of a profuse, purulent, vaginal discharge which may be occasionally tinged with blood. Both from the viewpoint of the history and the clinical findings, there may be no small resemblance between condyloma and malignant tumors of the cervix.

3. Gonorrhœal condylomata may occur singly as isolated pedunculated tumors or in clusters of papillomata which may almost entirely cover the cervix. These masses may present varying grades of inflammatory reaction. Gonorrhœal condyloma of the cervix may be accompanied by similar lesions on the vulva and perineum and also by salpingitis and its many manifestations, but in our experience the endometrium is not usually affected. The primary focus of infection appears to be in the cervical glands. In the treatment of gonorrhœal condyloma, it is necessary to clean up the focus of infection and also to remove the local growth. Curettage of the uterus is unnecessary and should not be performed.

4. Tuberculous condyloma of the cervix is almost always accompanied by other manifestations of the disease. There is almost always a concurrent tuberculous endometritis and salpingitis, and very frequently other lesions may be found. For this reason the operative treatment of the cervical lesion should be undertaken only after a careful study has been made and on the basis of sound surgical indication.

5. Prognosis. In gonorrhœal condyloma the outlook is uniformly good; in tuberculous the prognosis depends entirely upon the nature of the concomitant lesions and the method of treatment instituted.

NOTE.—I wish to express my thanks to Dr. Thomas S. Cullen for the numerous favors he has shown to me in the preparation of this short article. Also to Mr. Russell Leonard Drake, the artist who prepared the first two illustrations for me, I am most deeply indebted, and both to him and to Mr. Max Broedel (in whose department he is engaged) I express my sincere appreciation. I also take pleasure in acknowledging the courtesy shown to me by the publishers of Dr. Cullen's book on *Cancer of the Uterus*.

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THE X-RAY AFTER THE INFLATION OF THE PELVIC CAVITY WITH CARBON DIOXIDE GAS AS AN AID TO OBSTETRIC AND GYNECOLOGIC DIAGNOSIS[1]

By REUBEN PETERSON, M.D., F.A.C.S., Ann Arbor, Michigan

ANY new procedure introduced as an aid to diagnosis must meet certain requirements before it will be generally accepted. It must be practical, that is, its technique must be such as to require no elaborate or complicated apparatus. Especially is this true if the diagnostic procedure requires the presence of the patient. For example, one of the most universally employed diagnostic procedures, the Wassermann test, does not need to conform to the above requirement, since blood can be removed from the patient and sent to a laboratory. Whether the result of the test has been arrived at by a simple or complicated technique is a matter of indifference to the average physician who makes use of this diagnostic procedure. The same applies to other routine laboratory tests.

Secondly, the new procedure must be safe where ordinary common sense precautions are taken. This means that there shall be nothing inherently unsafe about it in the hands of examiners of ordinary skill. For example, demonstration of spirochætæ by puncture of the skull may be a most valuable diagnostic procedure, but it will be employed only by experts because of the dangers of such a procedure in ordinary skilled hands.

The diagnostic procedure I am going to discuss this evening can not in any sense be called new, since it has been used since 1912 when Weber employed the X-ray after air inflation of the abdomen. The extensive, careful, and successful work of Stein and Stewart in New York is known to you all and practically has demonstrated that roentgen examination of the abdominal and pelvic organs after the introduction of air or gas into the peritoneal cavity is a safe and useful diagnostic procedure. However, the procedure has not been generally adopted, especially as an aid to the diagnosis of pelvic lesions, for reasons which will be set forth later.

I am free to confess that at the start I was prejudiced against the method. In my ignorance and egotism I was quite convinced that I could make a better diagnosis by bimanual examination than could be done by roentgen examination after peritoneal gas inflation. Again, even in spite of the testimony of Stein and Stewart, I was not at all convinced that the method was entirely free from danger. In fact it required considerable urging on the part of my X-ray colleague, Doctor Van Zwaluwenburg, before I seriously took up this work at the University Hospital some 6 or 8 months ago.

I was influenced to introduce this diagnostic procedure into my clinic by the work of another New York investigator, Doctor Rubin. While Rubin frankly states that his work with tubal peritoneal gas inflation has been and should be limited to the single diagnostic point of determining the patency or non-patency of the tubes, it seemed to me that the two methods, transperitoneal and transuterine gas inflation, could, in certain cases at least, be combined to advantage. In fact I believe that a clear realization of this fact will prove of immense advantage to the gynecologist.

First of all, let us consider the question whether or not pelvic roentgenography can be an aid to obstetric and gynecologic diagnosis. If the bimanual examination is all-sufficient, pelvic roentgenography would be an interesting but altogether unnecessary diagnostic procedure. The answer to the question depends entirely upon what is meant by a pelvic diagnosis.

Perhaps I can illustrate this best by some of our experiences in the University Hospital gynecologic clinic. We got into the very reprehensible habit of stating after bimanual examination that a given pelvis was inflammatory either on one side or the other or both. Upon the degree of the inflammatory process

[1]Read before the Chicago Gynecological Society, February 18, 1921. (For discussion, see p. 202)

as revealed by vagino- and recto-abdominal examinations rested the decision as to whether the case was or was not operative.

This word "inflammatory" was all inclusive. It included lesions of the tube, ovary, adhesions, etc., but no attempt was made to be definite as to what organs or tissues were involved in the inflammatory process. In certain cases this is very difficult and in certain other cases impossible of determination by bimanual examination. From experience with hundreds of cases with approximately the same feel to the examining finger, we draw our conclusions as to what this particular inflammatory mass probably is. However, in the past we have not been very exact because of the difficulties of stating definitely the particular tissues involved and because we knew full well that the matter would be definitely settled at the operation.

Granted that this practice and reasoning be correct, what about border-line cases? Is the tube or ovary enlarged or thickened? Are they adherent or freely movable? Failure to make definite diagnoses prior to operation inevitably leads to slipshod, careless, and often very unfortunate diagnoses or errors in diagnosis. I will even go so far as to assert that the very fact that the pelvic organs are easier to palpate with accuracy than are, for instance, such organs as the stomach or liver, leads to inaccuracy in diagnosis.

After some 30 years' experience in a special field of work I took it for granted there was very little to be felt in the pelvis that I could not feel. I must confess that after my experiences with pelvic roentgenography my eyes have been opened to the fact that there are possibilities in relation to preoperative diagnosis I never dreamed of.

These remarks are for those of you who are receptive, ready to take advantage of any safe procedure capable of aiding diagnosis. On the contrary my remarks are not addressed to those who are never guilty of preoperative mistakes in diagnosis, to those who are backed up by three or four diagnoses, so that there is little chance of missing them all; nor am I much concerned with the man who will deliberately lie out of a mistake in diagnosis. My remarks are addressed to those who know they make mistakes and are ready to place themselves in a position where such errors may be avoided in future. To these I will say that pelvic roentgenography has been one of the most helpful and interesting studies I have ever made. It has been of immense help not only to me but to all members of my staff. It has led to more careful diagnoses, to the study of diagnostic errors in order that similar mistakes may be avoided, in short it has given new life and impetus to our routine work. We still perform a certain number of exploratory laparotomies for the reason that at times we are uncertain as to the exact intra-abdominal and pelvic conditions even after all methods of preoperative diagnosis have been employed. However, I may add that such explorations are far fewer in number now than was the case 6 months ago. Moreover this improvement has been due both directly and indirectly to the use of gas inflation roentgenographic methods.

Prior to the demonstration by lantern slides of the technique and results of pelvic roentgenography as employed in the obstetric and gynecologic clinic of the University Hospital, I desire to lay before you certain facts which you may bear in mind while you are viewing the slides.

Safety. The pelvis has been inflated with gas in over 150 cases with no reaction which could be attributable to the gas itself or to the method employed. This coincides with the experience of Stein and Stewart with transperitoneal gas inflation and with Rubin where transuterine inflation is employed. The combined experience of several hundred cases is more valuable than pages of theoretical objections to gas inflation on the ground that the methods are dangerous. It goes without saying that modern surgical methods of sterilization must be employed, but this is true when we introduce a uterine sound or perform abdominal paracentesis.

Actual experience and animal experimentation have shown that there is no danger of injuring the intestines by the needle thrust through the abdominal wall where the intestines are not adherent to the parietes. Where the puncture is made in the presence of adhesions common sense would lead the opera-

tor to select a locality on the abdominal wall free from adherent gut.

Discomfort from gas inflation. Very rarely will a patient be found who will suffer no discomfort from the injection of enough gas into the abdominal cavity to insure a satisfactory roentgenogram. The discomfort is not connected with the passage of the needle for this can be rendered practically painless by local anæsthesia. The discomfort is associated with and caused by the rapid distention of the peritoneal cavity. The more gas injected the greater the discomfort, hence our efforts should be directed to elaborating a technique which will give a good pelvic picture with the minimum amount of gas.

The average patient will begin to complain of discomfort about the lower abdomen when 400 or 500 cubic centimeters of gas have been introduced. The discomfort increases with the amount of gas injected so that patients may complain very bitterly after the introduction of more than 1000 cubic centimeters. Rarely now do we find it necessary to inject more than this amount.

It has been our experience that chronic pelvic and abdominal peritoneal inflammation increases the amount of the discomfort. This is what one would expect since the gas undoubtedly by distending the peritoneal sac stretches the adhesions.

Discomfort is increased by the rapid injection of the gas. This also is what we would expect as the same thing can be observed in rapid distention of such organs as the bladder or stomach. Always there exists a tendency to inflate the patient more quickly than is necessary. This tendency should be controlled if we are to reduce discomfort to a minimum.

Further experience will undoubtedly lead to improved methods by means of which there will be practically no discomfort and certainly no pain connected with gas inflation. I am convinced of this when I see how little the patients complain now in comparison with what they did when the gas was introduced in large quantities and more quickly than necessary.

The kind of gas to be used. We first used oxygen gas but have abandoned it for carbon dioxide gas because the latter is absorbed in from 15 to 20 minutes after the inflation has been completed. I say absorbed although I have not determined this fact experimentally. At any rate the patient ceases to complain of discomfort 10 or 15 minutes after the gas has been injected. In one-half hour patients walk from the examining room or leave the hospital without any discomfort. This is not the case when oxygen has been used where patients suffer for hours unless the gas be removed by another abdominal puncture.

The rapid absorption of the carbon dioxide gas necessitates rapid work in taking the X-ray plate, but that simply means the perfecting of a smoothly working technique.

Transuterine gas inflation. We have made some changes in Rubin's technique of passing gas through the uterus and tubes into the pelvic cavity. The uterine cannula is introduced in the Sims' position since in this position a better exposure of the cervix can be made. In this way iodine sterilization of the cervix is easier and the cervix possibly better steadied by the tenaculum prior to the introduction of the cannula. The gas is passed with six excursions of the siphon meter to the minute and no higher pressure than 200 millimeters is employed, since we have found that pressure to be sufficient for the passage of the gas if the tubes be permeable.

If the gas passes freely the inflation is continued until between 500 and 1000 cubic centimeters have entered the pelvis. The plate is then taken exactly as if the inflation had been made through the abdominal wall.

In acute or subacute pelvic conditions the transuterine route is contra-indicated and is never employed. The same holds true for patients beyond the menopause.

Transperitoneal route. In by far the largest number of cases this route for one reason or another is the method of choice. In 105 inflation cases 77 were by the abdominal, 23 by the transuterine route while in 5 cases the transperitoneal method was employed after the tubes were found to be impermeable.

We have abandoned the gas bag inflation method of Stein and Stewart in favor of the simple accurate method of Rubin. By this technique rapidity and pressure can be

accurately gauged and the method has proved eminently satisfactory.

Position of the patient. To insure successful pelvic roentgenography, the patient must be so placed as to allow of the gas rising upward and displacing the pelvic organs and forcing the intestinal coils out of the pelvis. After many trials with different positions, we are securing the best results with the moderate knee chest position with an inclined board beneath the thighs with a notch cut out for the tubes. The table is then tipped, as for the Trendelenburg position, the patient being prevented from slipping by shoulder straps.

An 18-inch square of opaque fabric with a 6½-inch circular hole cut out of its center is laid on the buttocks and serves as a diaphragm. A plate-changing tunnel is then placed horizontally on the table, double screen films are used, and a Coolidge portable unit operating in the ordinary lamp circuit furnishes the X-ray. An exposure of from 14 to 20 seconds is usually required.

SUMMARY

1. The uterus together with the tubes and ovaries can be clearly shown by pneumoperitoneal roentgenography.

2. Owing to their distention with gas the tubes are rather more clearly demonstrated by the X-ray where inflation has been brought about through the transuterine route than where the inflation has been made transperitoneally.

3. On account of the rapid absorption of carbon dioxide gas with equally rapid subsidence of the discomfort produced by the inflation, this gas should be used in preference to oxygen which is very slowly absorbed.

4. Irregularities of the uterus, omental and bowel adhesions are clearly demonstrated by the pneumoperitoneal X-ray.

5. In not a few instances the diseased and enlarged appendages are more clearly made out by pelvic roentgenography than by the most careful and searching bimanual examination even under anæsthesia.

6. With the improved position (knee chest and Trendelenburg) smaller and smaller quantities of gas will be necessary for inflation. Thus discomfort will be reduced to a minimum.

7. If the technique of pelvic roentgenography be good, retention of bowel coils in the pelvis will be proof of adhesions.

8. The pneumoperitoneal X-ray is able to demonstrate pregnancy at a much earlier period than is possible by the examining finger.

9. With good technique and good judgment in the selection of cases both transuterine and transperitoneal gas inflation are free from danger.

10. Bimanual pelvic examination and pelvic pneumoperitoneal roentgenography are not antagonistic diagnostic methods. Each is valuable and their value is enhanced if they be used in conjunction, each acting as a check upon the other.

RADIUM IN CARCINOMA OF THE UTERUS[1]

By WILLIAM KOHLMANN, M.D., F.A.C.S., New Orleans, Louisiana

WITH the discovery of the remarkable power possessed by radium, this element has been eagerly adopted by the medical profession as a symbol of hope, offering prolonged life and freedom from suffering to a great number of cases of cancer which, formerly, would have been considered absolutely hopeless, and the only temporary relief for which was morphine, and this could merely alleviate the suffering for a short time, for soon even this means would lose the power of deadening the pain. In the past few years, radium has been more and more used in the treatment of malignant disease, and the excellent and surprising results achieved in many cases, especially as a palliative measure in inoperable carcinoma, could not fail to impress the profession with its importance as a valuable adjunct of surgery in the treatment of malignancy. Moreover, in many instances, it is not only an adjunct, but may be compared very favorably in its effects with the results obtained by surgical measures, and frequently, in cases where surgery fails, it will bring about relief and even apparent cure.

The unsatisfactory results achieved by surgery in carcinoma of the uterus, especially in carcinoma of the cervix of the uterus, are only too well known. The radical operation, which, through the efforts of Rumpf, Clark, Ries, and others, has been developed in the last decade of the past century and has been improved and perfected in many details by Wertheim—whose results, reported in 1898, showed a generally considered high percentage of cures—has been employed for a number of years. The high mortality of this operation in all except the early cases, even in the hands of the most competent operators, and the complicating sequelæ, which frequently follow the operation, soon brought this method into disfavor. Janeway[1] has given interesting statistics showing the results of this operation, and with scarcely any exception, his experiences are those of every operator. Considering the low operability, the high operative mortality, and the percentage of cures—which after all is low—the possibility of a new treatment, which promised better results, was generally welcomed.

In contrast to this drastic course of treatment, the palliative and even curative results by radium have been surprising, and this fact has brought forward a number of questions:

1. Whether radium should be applied only in inoperable carcinoma, and after surgery has failed;

2. Whether it should be used in assistance to surgery, as preoperative and postoperative radiation; or

3. Whether it should be given the preference, that is, as the only treatment without any surgical interferemce whatsoever.

In inoperable carcinoma, the treatment with radium is accepted today as the treatment of choice. It accomplishes, without any great risk, more than any other method of treatment, and in some instances the primary results achieved by its application have been quite marvelous. In the treatment of recurrent carcinoma after panhysterectomy the reported results are not satisfactory although some primary improvement can be noted. Twelve such cases came under my observation, of which number 4 died, 5 could not be traced (probably have died), 3 have been clinically well for 2½ years.

Preoperative radiation should have a distinct value, but should be followed by early operation, not later than 4 weeks. If radiation is repeated and operation is postponed, the tissue changes have progressed to such a degree that the surgical procedure is difficult. I have operated upon 4 such cases from 2 to 3 months after radiation. No special benefit could be noted in regard to the progress of the disease. As a routine treatment, I employ postoperative application of

[1]Surg., Gynec. & Obst., 1910, xxix, 242.

[1] Read before the Southern Surgical Association, Hot Springs, Virginia, December 14-16 .1920.

radium. Nine cases have been treated in this manner, of which 3 have been well for over 3 years, 1 has been well for over 1 year, 1 is living but not improved, and 4 are dead.

Great care is necessary in the application of the radium because of the formation of cicatricial tissue due to the previous operation and because of the close proximity of the bladder and rectum. If particular attention is given to this fact, and careful screening applied, I believe the danger of fistula can be avoided. Postoperative radiation by the roentgen-ray might be preferably applied. I employed this method before radium was at my disposal.

In regard to the question as to whether radium should be the treatment of choice in early and operable carcinoma, there is no uniformity of opinion thus far. As, however, radiotherapy, in the course of time, is making itself more and more felt, we will soon have to make a decision as to whether surgery, combined with preoperative and postoperative radiation, or radium alone is to have the preference. He who believes that postoperative radiation is advisable is primarily a believer in radiation and he must be firmly convinced that radiation influences the carcinomatous tissue which may not have been removed—that it destroys cells for a certain distance, or at any rate that it checks their growth. During the last few years, I have had occasion to employ radium as the only treatment in a few early cases, where surgery, on account of complicating disease, was contraindicated. The results in these cases have been in the highest degree satisfactory, and so far the most extensive surgical operation could not have produced results to surpass those obtained, except that in one case, after primary improvement and apparent cure, there was a sudden fulminating recurrence, followed by death as the result of hæmorrhage. This case was complicated with diabetes, and it is possible that the constitutional disease was, to some extent, predisposing to the rapid, violent recurrence.

Von Seuffert mentions the fact that in constitutional diseases, lues, and especially diabetes, great care should be exercised. Six cases of this type have been under my observation. One has been free from symptoms for more than 3 years and has received no treatment; one has been free of symptoms for 1½ years and has had no treatment; two have been free from symptoms for 6 months; one could not be traced, and one died.

Cures of this kind seem to be more certain and one looks for less frequent local recurrences after treatment with radium since there is not the danger of spreading carcinoma cells over freshly cut surfaces and in this way grafting the malignant disease on to healthy organs which is likely to happen during an operative precedure.

Frequently, objection is raised to the use of radium in the belief that the claims made in its behalf are not justified. We must not allow patients and their attending medical advisers as well, to have the impression that radium is a sure and permanent cure in all, and especially in advanced cases, in which only palliative results can be expected. If radium is applied in early cases before metastasis has occurred, a cure may be expected. Unfortunately, however, it is hardly possible to fix such a time with any degree of certainty. In advanced cases where metastasis has already occurred, especially where glands at a greater distance are affected and which can scarcely be reached by radiation, permanent results cannot be expected.

This brings up the question as to how far reaching the effect of radium may be. The extent of the therapeutic effect of radium has yet to be investigated, and a great deal of experimental as well as clinical work must be carried on in the next few years. Such work is now possible with the increased quantity of radium at our disposal and the increased interest that the medical profession is taking in its application. This interest in itself, speaks for the general belief that great things are to be expected from radiumtherapy.

Radium radiation is considered effective at a distance of from 3 to 5 centimeters, depending on the quantity and quality of the ray. The radio-sensibility of the surrounding tissue must be considered too, as it varies in individual cases, no doubt, causing a marked irritability of the bladder and rectum in certain cases, and in others producing, with the

same dose, no such unpleasant, irritating symptoms.

The combination of roentgen and radium radiation will have to be considered in the future, in order to extend the area of radiation beyond the pelvis and to subject the iliac regions to the same intense treatment as has been applied to the pelvic cavity. More attention has been devoted to this procedure in recent years, and it has been discussed by Seitz and Wintz under the name of Roentgen-Wertheim.

The effect of radiation in cases of carcinoma can be noted clinically in a very few days after the application. Three or four days after the treatment, the infiltration and tumefaction of the cervix are diminished, a process which is gradually followed by the shrinking of the mass and infiltration of the broad ligaments. This action of radium is most probably due to the destruction of the carcinoma cells and an increase in the formation of connective tissue, which, by shrinking and cicatrization has a tendency to interfere with the life of the carcinoma cells.

Believing that a reduced blood supply and an increased development of connective cicatricial tissue are important factors in securing results with radium treatment, I have been using a method previously advised as an adjunct to cauterization, especially in extensive cauterization as recommended by Percy. This method consists in the ligation of the internal iliac and ovarian arteries prior to radiation, or simultaneously with the application of the radium. In this way I hoped to augment the effect of the ray by cutting down the blood supply and starving the diseased area. I have applied this method of treatment in 12 cases during the past 3 years. Five were not benefited and died, 6 show primary cure, 1 is unimproved but still living after 10 months. Of the six showing primary cures 1 is well for 1 year and 8 months, 1 is well for 1 year and 7 months, 1 is well for 1 year and 5 months, 1 is well for 1 year and 2 months, 1 is well for 8 months, 1 is well for 3 months. These cases were not selected, and two were so far advanced that the ligature of the ovarian artery was impossible on account of infiltration. It is my opinion that some of these cases have been materially benefited by this method. Cases of similar type under treatment at the same time, which were subjected to radiation only, did not improve, or had recurrence after temporary amelioration of the local and general symptoms.

Since June, 1915, 96 cases of carcinoma of the uterus have come under my observation in my private work and my service at the Touro Infirmary, and of this number 56 were treated with radium only. All the cases were examined microscopically and the clinical diagnosis of carcinoma was confirmed. With very few exceptions, all cases were benefited and showed improvement in regard to both general and local symptoms. Some of the cases had improved to such an extent that a cure could be hoped for. Cases which did not show improvement after one or two treatments have not been influenced, as a rule, even after prolonged treatment. Recurrences after apparent clinical cure by radium were observed mostly in 6 to 9 months, and further application in these cases has been without benefit. Almost all of these cases have been of a very advanced type, and it is doubtful whether any other method of treatment could have been employed without immediately endangering the life of the patient. Even if there were no marked results in regard to a permanent cure, the palliative influence on the local and general symptoms was remarkable.

Of 22 cases living today 1 is well for 4 years, 1 is well for 3 years, 2 are well for 2 years. (One of these has vesicovaginal and rectovaginal fistula.)

The remaining cases of this group have been under treatment for less than 12 months.

Of 22 cases which have died 2 had been well for 3 years, but died of intercurrent pneumonia; 1, a woman of 39 years, died, free of recurrence for 1½ years.

The time of observation for the entire series has been too short to be able to speak of any permanent cure, or even to compute a percentage, but the outlook is hopeful that, at the end of a five year period there may be a fair percentage living, especially of the early cases, which were treated by radium only.

To simplify the survey of the results, I have divided the cases into three large groups:

Group 1: Carcinomata which are early and easily operable: (a) Cases treated with radium only. (b) Cases with panhysterectomy and postoperative radiation.

Group 2: Carcinomata, that are doubtful and inoperable: (a) Cases treated with radium. (b) Cases treated with ligation and radium.

Group 3: Recurrence of carcinoma after panhysterectomy.

	Living	*Dead*	*No Report*	
Group 1:				
a.	4	1	1	6
b.	5	4	0	9
Group 2:				
a.	22	22	12	56
b.	7	5	0	12
Group 3:	4	4	5	13
			Total	96

In regard to the treatment, I am greatly indebted to Drs. Samuel and Bowie, radiotherapists of the Touro Infirmary, for their valuable assistance and co-operation. The technique that has been followed in the application of the radium has been extremely simple. The silver tubes, 1½ millimeters thick, each containing 25 or 50 milligrams of radium, after being placed in a 3-millimeter brass filter, are covered by a soft rubber finger cot, the end of which is tied. This cot is then put in the cancer crater which is present in most advanced cases and allowed to remain for 12 hours. The vagina is packed with sterile gauze to protect the rectum and bladder as far as possible. No retention catheter is employed. After one application, the mass usually shrinks and a second application is then made intracervically. Fifty milligrams of radium covered by a celluloid capsule is introduced into the cervix, and 50 milligrams or more put into the still existing crater, or upper part of the vagina, and held there by a gauze pack.

In most cases, these applications were made in 8- to 10-day intervals, and then the patient was asked to return every 4 to 6 weeks for examination. If, upon examination, the patient was found improved, and some infiltrated tissue was still present, applications were repeated. In cases where no improvement could be observed, further treatment was without success. Many cases had been clinically well after 3 months. I have followed the rule of applying radium at intervals of 3 months in all inoperable cases which had clinically improved. In the earlier cases, no further treatment was employed.

During the past year, there was some slight variation in the method of treatment, and this change has proved so far quite satisfactory and is rather more convenient to the patient. The time of the first application is prolonged to 24 hours, and repeated after 6 weeks for the same length of time.

HISTORY OF CASES

CASE 1. Mrs. St. M., age 51. T. I. No. 61,359. Up to 8 months before treatment patient had been in good health. The menses were regular; every 28 days, lasting 4 days and were without pain. Since treatment there has been a slight vaginal discharge with blood, no odor. The patient has lost weight.

Vaginal examination revealed an enlarged cervix with the posterior lip especially thickened and ulcerated. A diagnosis of carcinoma was made and confirmed by microscopic examination of a small section. As the patient had symptoms of an early pulmonary lesion, a radical operation was not advisable.

Treatment. On July 19, 1917, 50 milligrams of radium were given vaginally; on July 30, 1917, 50 milligrams, and on August 8, 1917, 25 milligrams. The patient began to improve, the vaginal ulceration entirely disappeared, and on September 10, 1917, 50 milligrams of radium were given intracervically. Since treatment the patient has been under observation and the last examination showed the cervix small, soft, and smooth.

CASE 2. Mrs. V., age 55. T. I. No. 74,645. Menses stopped 2 years before (?). Patient had vaginal discharge for few months. The attending physician advised treatment with radium in preference to operation because patient had heart lesion. The cervix uteri was enlarged and ulcerated and microscopic examination proved malignancy. The patient was at the time suffering from symptoms of cardiac decompensation.

Treatment. On May 6, 1919, 50 milligrams of radium were given for a period of 8 hours; May 13, 1919, 50 milligrams for 8 hours; May 20, 1919, 50 milligrams for 8 hours; June 24, 1919, 50 milligrams for 9 hours; and September 9, 1920, 75 milligrams for 12 hours. After a few days the cervix became small and smooth and there was no discharge.

CASE 3. Mrs. M. A., age 46. T. I. No. 74,713. The patient suffered from a vaginal discharge at times bloody, every few days. The menses were regular every 2 or 3 months. The cervix was thickened, enlarged, and the posterior lip was ulcerated. A rush diagnosis was made of carcinoma.

Treatment. On May 10, 1919, after curettage 50 milligrams of radium were applied intracervically; on May 17, 1919, 50 milligrams of radium were applied intracervically and 25 milligrams vaginally; on May 24, 1919, the patient showed improvement and the cervix felt small and smooth; on September 28, 1919, the patient still continued to do well and was apparently cured—75 milligrams of radium were applied for 12 hours; on January 6, 1920, the patient returned. The posterior lip of the cervix was entirely destroyed, the vaginal wall was infiltrated. She had a severe hæmorrhage at home and had continued bloody discharge. Seventy-five milligrams of radium were given vaginally for 12 hours. There was no relief and patient died a few weeks later.

CASE 4. Mrs. L. T., age 39. T. I. No. 55,783. The patient had been losing blood from the vagina for 3 months. There was no pain, she did not lose weight. Vaginal examination showed an ulceration of the cervix and slight involvement of the vagina.

Treatment. On August 28, 1916, 50 milligrams of radium were applied intracervically for 12 hours; on September 7, 1916, 50 milligrams were applied vaginally for 12 hours; and on September 30, 1916, 75 milligrams were applied vaginally for 10 hours.

CASE 5. Mrs. E. DeM., age 48 years. T. I. No. 84,529. Patient suffered from ulceration of cervix with a good deal of discharge for about 6 months.

Treatment. On August 4, 1920, 50 milligrams of radium were given intracervically for 24 hours; and 50 milligrams vaginally for the same time; on September 8, 1920, 100 milligrams of radium were given vaginally for 24 hours. Cervix smooth and normal.

CASE 6. Mrs. M. E., age 48. T. I. No. 85,610. The patient suffered from carcinoma of the cervix with ulceration over the posterior lip of the cervix.

Treatment. On September 28, 1920, 50 milligrams of radium were given intracervically for 24 hours; October 29, 1920, 50 milligrams were given vaginally for 8 hours. The ulceration disappeared.

THE HISTOLOGICAL CHANGES INCIDENT TO RADIUM AND X-RAY TREATMENT OF UTERINE CARCINOMA

BY DOZENT DR. O. FRANKL AND DR. I. AMREICH, VIENNA

TO determine the gradual changes brought about by radium and X-ray therapy and to standardize the technique of application, we have attempted to learn by means of a study of serial sections of excised tissue taken at different intervals from the crater and its edge in carcinoma of the uterus, at what time the action of radium or the rays is greatest and the point at which the effect of the rays or radium begins to lessen. We proceeded as follows:

Radium. A series of five treatments was given, each covering a period of 12 hours, at intervals of 1 to 2 days. We used 50 milligrams of radium in a platinum or brass filter with 1 centimeter cotton and rubber condon.

X-ray. We used a symmetrical apparatus, raying at a focal distance of 22 centimeters and giving a maximum dose of 18 Holzknecht units, filtering through 3 millimeters of brass, 0.5 millimeter of zinc, wood or chamois four times as thick; 3 milliamperes, 11 Benoist, 40 minutes per field. Eight to nine fields were covered, three or four in front, four in back, and one in the perineal region. In the first series the portio was treated, in the second the parametrium, and in each eight or nine fields were covered. The second series was given after 6 weeks.

We shall cite first our notes from a case of papillary carcinoma with small, densely packed cells of an immature type with extensive involvement of the stroma, for in this case we were able to make a precise study of the changes produced by the radiological treatment. Three days after the first treatment the tissue excised from the crater showed œdema of the stroma and the formation of œdematous lacunæ together with a number of intact carcinomatous nests. There was also extensive vascularization. Examination of a small piece of tissue from the edge of the crater showed no marked changes. Four days after the first and 12 hours after the second treatment, we found that the carcinoma cells directly played upon by the rays were greatly swollen, the nuclei were increased in size but well stained; the stroma showed loosening and œdematous changes; the alveoli were surrounded by an œdematous fluid preventing

the stroma from adhering closely to the epithelial nests. Pieces of tissue taken from the edge of the crater presented similar changes: slight œdema and in certain places enlarged carcinomatous cells. On the fifth day after the first, and 12 hours after the third, treatment we saw in those portions directly exposed a very marked œdema, the pseudopapillary tissue enormously swollen and the vessels in these papillæ (which were elongated and thickened) dilated. Epithelial cells were found detached from the nests and scattered in the detritus. On the sixth day after the first treatment we noticed the same sort of changes at the edge of the crater; œdema separating the stroma from the alveoli of the carcinoma and numerous detached cells within the œdematous areas. The carcinoma cells were greatly increased in size. On the seventh day we found the nests almost destroyed, the cells broken up into débris and a few cells lying in the periphery indicating the former extent of the carcinoma. In the centers were a few nucleated cells, also hyaline remnants of greatly enlarged carcinoma cells. Areas of œdema were present and the immigration of lymphocytes caused loosening of the carcinomatous cell masses.

Exactly the same changes were observed in the portions which were only directly exposed to the rays. Vacuolization was a distinct feature of the histological picture. On the ninth day after the first, 3½ days after the fourth, treatment we saw in the portions indirectly treated changes which indicated a turning point in the effect of the rays; the alveoli were broken up, the cells showed enlargement, vacuolization, and hyaline changes. On the tenth and eleventh days we found a breaking down of the nests of carcinoma cells and penetration by the lymphocytes. These changes occurred in the portions which were exposed either directly or indirectly to the rays. On the eleventh day the areas indirectly rayed showed in the center of an alveolus composed of vacuolized cells a number of proliferating carcinoma cells which indicated that the action of the rays was becoming less effective. Passing to the twenty-sixth day after the first treatment we found that the areas which had been directly rayed showed scattered remnants of carcinomatous tissue with very few cells surrounded by hyaline and structureless cell aggregations. Forty-one days after the first treatment, we found, besides altered tissue masses, rapidly proliferating carcinoma cells resembling those present before treatment.

We therefore concluded that the areas directly exposed to the rays showed the first changes on the third and fourth days; that that influence of the rays was greatest between the fifth and seventh days; and that the rays were no longer effective after the fortieth day, when the genoceptors of the cells became active and caused proliferation. Areas indirectly treated were slower in showing the changes and the effect wore off sooner.

Comparing the results obtained from X-ray treatment and radiumtherapy, we find the same histological changes: first œdema, then enlargement of the cells and the carcinoma-nest penetration of lymphocytes, vacuolization, and other changes found after such treatment. On the whole, we found that the changes took place sooner after treatment with the X-ray than with radium. One point should be emphasized and that is that in a case which reacted very favorably to X-ray treatment there was complete omission of the stage of enlargement of the cell. This change does not seem to be desirable in radiotherapy; it is rather a form of cellular regression and does not lead to cell destruction. Our specimens show that swollen cells may proliferate in every part of the alveolus. The nutriceptors are apparently injured to a greater extent than the genoceptors and only the complete elimination of the latter prevents proliferation of the carcinomatous tissue.

SUMMARY

There are distinct differences between direct and indirect ray treatment. Carcinoma cells respond more quickly to the action of the X-ray than to radium and do not show the stage marked by the swelling of the cell body. These facts induce us to advise the use of the X-ray in treating the parametrium and the glands, while the use of radium is preferable in treatment of the carcinomatous crater.

REMOVAL OF VENTRAL TUMORS OF THE SACRUM BY THE POSTERIOR ROUTE[1]

By HERMAN E. PEARSE, M.D., F.A.C.S., Kansas City, Missouri

VENTRAL tumors of the sacrum first described and brought into surgical literature by Middledorph[1] form an interesting group. The name "Middledorph tumors" clings to them although Law's name of "ventral tumors" of the sacrum is perhaps better nomenclature.

These tumors interest the operating surgeon through the oddity of their origin and placement, the difficulty of their removal, and their dangerous habits of rapid growth and greedy encroachment upon bladder, bowel, and ureter. They interest and puzzle the pathologist by the varied character of their cell formation and by the structural anomalies they present. The confusion of the amateur pathologist who attempts their study is only exceeded by the confusion of the amateur operator who attempts their removal. Both will have occasion to wish themselves well out of the case.

In 1912 Law,[2] of Minneapolis, read before this society an article entitled "Ventral Tumors of the Sacrum" in which he gave a clear account of the origin and development of these tumors and their minute as well as gross anatomy. Their origin seems well established. Embryonic remains they surely are. Their many-sided pathology; the variations in their microscopic structure; the confusing reports from laboratories as to their classification; the varying cytology of these tumors may be well accounted for by extensive development which normally and anatomically grows from the wolffian bodies, and it is from these wolffian bodies with their embryonic cycles of origin, function, degeneration and quiescent persistence that these tumors oftenest spring. They lie in the region where in the embryo the neural canal differentiates itself from the intestinal canal and where the wolffian body becomes the renal system, and the wolffian duct becomes the vas deferens in the male, and degenerates in the female. It is here in the adult that bladder, ureter, bowel, and vas are contiguous. The tumors lie ventral to the cup-shaped cavity of the sacrum. They shove their bulk forward and can be felt above the pubic bone, and when large may be seen there. They thus invite attack by ventral incision and the literature shows cases that have gone on to serious, even fatal condition, owing to the destruction of tissue, the difficulty of controlling hæmorrhage, and the infection of the operative field incident to an operation that traversed the peritoneum to reach the seat of dissection and excision; yet the dorsal position for the operative case is such a common one that unless carefully instructed a house service is apt to present such a case prepared for ventral section. An added invitation to suprapubic attack is the error in diagnosis that so often records these tumors as intraperitoneal, ovarian, parovarian, or uterine. When such an attempt is made and the abdomen opened in front in the lower middle line, an operator who has not attempted such a task before is inclined to go on and shell out the tumor which he finds behind the pelvic viscera. He is working deeply and the control of hæmorrhage is difficult. As he progresses his difficulties increase. Realizing perhaps the futility of completing the removal of such a growth from a suprapubic incision, the surgeon may supplement it with an attack by the perineal route only to be balked by the bowel and ureter pushed down by the growth. There remains the attack by the sacral incision. While a posterior incision and a sacral resection is an ideal way to reach these growths, it is practically impossible to do it supplementary to an abdominal incision. Rules of technique are outraged.

It is the purpose of this paper to call attention briefly to these tumors and the reasons for their removal by the posterior route. Kocher in 1874, and many writers since his

[1] Middledorph. Arch. f. Path. Anat., etc., Berl., 1885, vi, 37.
[2] Tr. West. Surg. Ass., 1912.

[1] Read before the Western Surgical Association, Los Angeles, December 3-4, 1920.

time have invaded the pelvis, at least the posterior inferior pelvis by way of the sacrum, but Kraske, of Frieburg, established and published the technique that met the approval of the surgical world, and his name by common consent is given to the procedure of opening the pelvis by resection of the sacrum. The essentials of sacral resection for removal of tumors from the pelvis are that:

1. The patient be placed on his face with pelvis well raised and thighs flexed.

2. An incision be made from just posterior to the anus upward in the middle line and carried above the coccyx; then curving to the left it follows the left edge of the sacrum. It is carried down to the bone and dissected outward right and left exposing the edges of the sacrum and the sacrosciatic ligament, and carrying the edges of the gluteal muscle.

3. The third sacral nerves must be identified and the sacrum divided below them. They should if possible remain intact. The central canal of the sacrum should not be opened. The attachment of the sacrosciatic ligament to the coccyx should then be severed, also the lower sacrum should be freed with a blunt dissector from all connections. The amputation is best done with a wire saw. The use of chisel and mallet here causes shock.

4. Thus the field lies before us. All bleeding is arrested and the growth attacked according to its location, attachment and adhesions.

From this point the operation may be of any severity, usually it will be exceedingly simple. All Middledorph tumors should be attacked from this direction for the following reasons:

1. They lie directly in front of the sacrum. When it is lifted off they can be studied in plain view.

2. They can then be removed systematically without disturbing the remainder of the pelvic viscera.

3. The peritoneum is not opened in reaching the tumor. If it is opened later in the removal it is not traversed and infected, and its contents may be protected.

4. The cautery may be used freely without damage to other structures.

5. Extensive tissue removal in handling the tumor's connections in muscle, fat and fascia, even bone, can be made quickly, safely and extensively because in plain sight.

6. Scar recurrence is in plain view and accessible to secondary operation.

7. Blood supply and nerve supply can be seen and easily attended to.

All of these reasons are anatomical; have to do with technique; are more or less self-evident. The sixth one calls upon us to go a bit more into the pathology of these growths, as it touches the treatment of their recurrence in or about the scar after operating for their removal. They are pathologically and clinically malignant. Their malignancy is clinically of the nature of the sarcoma. They travel along lines of blood supply. Their metastases are into muscle and fascia and fatty tissue oftener than in lymph nodes. Their recurrence is along scars made for their removal. They show the cytology of hypernephroma or nerve tissue or mixed tumors when the pathologist examines them, but to the eye of the clinical surgeon they follow the habits of the sarcoma.

Mr. D. B. H. of Verona, Missouri, came to my service in St Luke's Hospital, March 15, 1915, complaining of pain down in the lower bowel so constant it required opiates. He was 63 years of age, a lumberman, referred to me by Dr. Loveland.

The patient suspected lues 20 years ago. He had been fairly well treated and for 2 years had no relapse. There had been no subsequent manifestation of the disease.

Present illness. Beyond the pain in the pelvis there were no other symptoms. Two years ago he had noticed for the first time pain over the tip of the spine. He went to St. Louis and saw Dr. C. who sent him to Dr. F. Neither gave him a diagnosis. He then went to Hot Springs and was treated for lues. Afterward he was given several salvarsan treatments at Springfield. The antiluetic treatment did not help the pain. The patient was constantly in pain between times. The pain became excruciating when bowels acted. About a year ago he began to take antipyrene, codein and phenacetin to stop the pain. Wassermann negative.

Physical examination. Two weeks before the operation the examining finger came upon a more or less cystic feeling tumor in front of the coccyx and lower sacrum. It was almost in a mid-line and could not be moved by backward pressure.

Diagnosis. Ventral tumor of the sacrum; teratomatous in origin; congenital in development; sarcomatous in degeneration. Removal advised and accepted.

Operation. March 31, 1915. An incision was made from the left posterior superior iliac spine and

curved in toward the central portion of the sacrum down to the anus. The tissues were separated from the tip of the coccyx and rectum by blunt dissection, also separated from the face of the tumor. It was found on each side of the coccyx the tumor had involved each gluteus maximus. The involved portion of these muscles were cut about three-fourths of an inch to an inch on the outside of the tumor. The third sacral notch was found and the sacrum fractured across with a large chisel at this level. At this time the patient suffered extreme shock, and the blood became very dark. The tumor was rotated out of its position and found to be limited above by the peritoneum. The blood vessels were secured, the tumor removed, and all bleeding stopped; the skin was approximated. Two drains were inserted, one on each side of rectum, and the patient was put back to bed.

Shock reappeared several times the day of operation. Drainage was out in 24 hours. The patient had perfect use of his limbs when recovered. All pain ceased when operation was completed. No pain since.

September 1, 1915. The patient complains of a feeling of prolapse when bowels move, due, it was found, to the cutting away of the attachments of the levator ani muscle. An ingenious truss by an instrument maker relieved this.

October 22, 1917. Patient is well. No trouble since relieving the anterior rectal displacement by a brace lifting the perineum. Muscles became stronger except now he has a return of pain. Rheumatism in left leg from hip downward.

September 11, 1919. Patient returned with tumor to left of scar. This tumor was small, movable, but attached to the muscles. He entered my service at the Research Hospital and was operated upon September 12, 1919. Incision was made according to, and following the line of the former operation. At the lower angle of the incision, a hard tumor about 1 inch in diameter by ⅞ inch in length, was encountered. This was lying on the fascia involving the fascia and also the gluteal muscle. All portions of muscle and fascia involved were removed. The tumor had not attached itself to the bowel. The entire tumor and surrounding fat, fascia, and muscle were taken out and referred to the laboratory. The pathologist's report showed the growth to be hypernephroma.

The patient made an uninterrupted recovery, and was discharged October 4, the wound granulating nicely.

November 4, 1919. Patient writes that he is getting along very well. Is feeling fine, and helping to look after his business.

June 9, 1920. Patient reported at office. Examination shows a lump the size of hazel nut and movable in the upper part of the scar. Also a larger lobulated tumor high up on the right side under the right gluteal muscle.

June 9, 1920. He entered my service at St. Mary's Hospital and was examined by several members of the staff. The malignant nature of the tumor was conceded because of its recurrence. He was X-rayed thoroughly before operation as follows: June 11, 1920, by 4 points of entry posterior; June 12, 1920, by 5 points of entry posterior; June 13, 1920, by 5 points of entry anterior; June 14, 1920, by 5 points of entry posterior.

The X-ray work was by a Coolidge tube 9½-inch spark gap, for 7 minutes, protected by 6 filters of aluminum, 5 milliamperes of current, 8-inch target-skin distance. This being completed he was operated upon June 15, 1920. The operation sheet shows the following record: The incision went to the left of the first incision of 1915 which had left a clean soft scar. The removal of the lower sacrum left the tumor (recurrent) in plain view covered only by skin and fascia. It was very easily removed and offered but few obstacles. It was extremely simple compared with what would have been the case if operation had been attempted by any other route.

Four nodules were found, the smallest one 0.5 inch in diameter; the largest, 1.5 inches. The lowest was in the levator ani muscle fibers, the others were in the gluteal muscle. All were removed very wide of disease. The rectum was not opened but it was exposed for 6 inches. Care was taken to provide against prolapse of tissues by suture of the fascia to the former scar. Drainage was provided and the wound closed.

There was no shock and no delay in commencing convalescence. After examination of all tissue removed, and a careful review of the case history the diagnosis of hypernephroma was abandoned by the members of the Pathology Club and the original diagnosis of Middledorph tumor of neural origin was confirmed by them.

The patient's progress record shows the following entries:

June 15, 1920, patient had no shock, he awoke hoarse with a laryngitis; June 16, 1920, same condition of throat; June 17, 1920, removed tubes and packing from sacral wound; June 19, 1920, a little hoarse, otherwise doing well; June 21, 1920, post-operative microscopic report hypernephroma by the pathologist of St. Mary's; June 25, 1920, packing wound with balsam of Peru and castor oil because of a breaking down of the lower end of the wound, wound has gray appearance at lower angle; June 26, 1920, patient is doing well. The gray appearance of the lower end of the wound has disappeared somewhat under castor oil and balsam of Peru treatment. Patient is to be discharged today and to place himself under the care of the family physician who will be directed as to treatment. He will return at intervals of 3 weeks for further X-ray treatments and region is to be carefully watched.

The ease of approach; the ease of future observation and of future reoperation and the freedom from disturbance of other organs

marks the posterior route as the best route for the removal of these tumors.

The patient has since returned and has been X-rayed with a 9½-inch spark gap 4 times at intervals of 3 weeks receiving 5 milliamperes of current at each port of entry. He was treated through "24 ports of entry, fore and aft," at each series. The value of having all scar tissue readily accessible to X-ray again emphasizes the desirability of the sacral resection route for removal of these tumors.

NOTE—June 20, 1921. The patient returned for examination 1 year after the third operation and 9 months after his last X-ray. There is no evidence of recurrence.

A CRITICAL STUDY OF AN ORGANISM ASSOCIATED WITH A TRANSPLANTABLE CARCINOMA OF THE WHITE MOUSE[1]

BY JOHN W. NUZUM, M.D., CHICAGO
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SINCE Jensen's observation in 1901 that a spontaneous alveolar carcinoma occurring in the breast of a white mouse could be transplanted into normal white mice, many investigators have studied the transplantable tumors of the lower animals in countless laboratories throughout the world. Information of great value has accumulated therefrom. The transplantation of minute fragments of the original tumor into the breast tissues of other mice gives rise to a very small percentage of tumors in the first generation. Subsequent inoculations gradually yield a larger percentage of takes. After several animal passages the tumor virulence or adaptation may be so enhanced that tumors identical in structure with the original carcinoma grow in from 60 to 100 per cent of the mice so inoculated.

It is generally believed that the transplantable carcinomata arise from small peripheral islands of cancer cells which survive the transfer. The specificity of the cancer cell, i.e., the fact that these tumors are transplantable only in mice tends to throw the cancer problem into the category of tissue grafting in general.

The study to be reported has been conducted during the past 2 years with a transplantable mouse carcinoma originally received through the kindness of Dr. F. C. Wood.[2] It is known in his laboratory as the Crocker Fund Carcinoma No. 11. This tumor has been transplanted through more than one hundred generations of white mice. Its virulence is such that it now yields from 60 to 100 per cent of successful takes under favorable conditions.

When inoculated into the loose subcutaneous tissues of the white mouse the tumor grows by expansion rather than infiltration, giving rise to larger encapsulated growths. These ulcerate commonly at the end of 5 to 6 weeks, producing cachexia and death of the animal. Metastases rarely occur when the tumors are inoculated subcutaneously. If the tumor cells are inoculated into the solid viscera of the mouse, i.e., into the liver or spleen, the cancers gradually tend to grow by infiltration and metastasize into the various organs of the body retaining essentially the same histological structure. Hence it would appear that the distinctions between benign expansive and malignant infiltrating growth are not rigidly maintained in the transplantable tumors of mice.

An incomplete review of the voluminous literature on cancer shows that various bacteria as inciting agents have been incriminated by numerous investigators in their ceaseless search for a "cancer parasite." But in each instance the critical etiological proof, i.e., the production of genuine carcinoma by the inoculation of bacteria in pure culture, has failed.

[2] A part of this investigation was conducted in the surgical clinic of Dr. George W. Crile at the Lakeside Hospital, Cleveland, during the past summer. The writer wishes to take this opportunity to thank Dr. Crile and his associates for every kindness shown him.

[1] Read before the Chicago Surgical Society, May 6, 1921. (For discussion see p. 205.)

Peyton Rous[1] has shown conclusively that several different varieties of sarcomata in fowls may be due to a filtrable agent or virus. The virus passed Berkefeld filters which held back all tumor cells. Moreover, the tumor-producing agent resisted dessication and reproduced new tumors after preservation in the dried state for 7 months in the icebox. From his careful study he concludes that two factors are concerned in the causation of chicken sarcomata; one the cell itself and the other a filtrable agent. Either one or both agents may act to reproduce the sarcoma.

Still more suggestive is the recent work of Keysser[2] who has been able to transmit both human carcinoma and sarcoma to white mice by injection of a fine watery emulsion of human tumor cells into the solid viscera of the mouse. Furthermore, he was able to transplant these tumors into subsequent generations of mice observing a steady increase both in virulence and percentage of takes of the inoculated tumors. Since the tumor cells of man cannot live in a foreign host such as the white mouse, the conclusion seems irresistible that the cancer cells may carry with them some other agent which is the real inciting cause of carcinoma.

After 7 years of experimental study on the tumor problem in collaboration with Wassermann, Keysser emphasizes the fact that only under certain conditions has it been possible to obtain his important results, viz., the tumor cells must be at their maximal degree of virulence. His observations throw a new light on the cancer problem.

In order to determine whether or not some living micro-organism capable of cultivation might not be found associated with the tumor cells, acting possibly as a constant irritant to the cell nuclei, the following bacteriological studies have been made:

METHOD OF CULTIVATION

A large series of white mice was inoculated with sterile grafts of the Crocker carcinoma No. 11 by means of a trocar introduced into the subcutaneous tissues and more often into the groins or axillæ. In other instances multiple injections of the sterile, fine, watery tumor emulsion were made into the liver and peritoneal cavity. The tumors were removed aseptically when about 1 centimeter in diameter and inoculated into various solid cultural media under aerobic and anaerobic conditions. No growth resulted aside from occasional contaminations using the ordinary solid cultural media.

Inoculations of the carcinoma fragments into tubes of tissue ascitic fluid media overlaid with sterile paraffin oil or solid petrolatum, according to the method introduced by Theobald Smith and employed more exclusively by Noguchi, Foster, and others in the cultivation of filtrable viruses, has given results of an entirely different nature.

The culture media found most suitable consists of sterile human ascitic fluid. Into tall test tubes about 20 by 1.5 centimeters a fragment of sterile rabbit kidney or brain tissue is transferred and the tissue covered with 10 to 15 cubic centimeters of ascitic fluid. The ascitic fluid is next overlaid with 3 to 4 cubic centimeters of sterile paraffin oil. In other instances solid paraffin of a low melting point has been utilized to effect partial anaerobic conditions. The entire batch of tubes is now incubated for 3 to 7 days. Any tube presenting gross turbidity or gas formation is discarded forthwith as contaminated. With careful technique, the majority of tubes remain brilliantly clear. A sterile Pasteur capillary pipette is inserted down to the region of the tissue fragment and stained smears prepared further to safeguard against contamination.

For each individual mouse tumor five or more tubes of the media are now inoculated with fragments of the cancer tissue aseptically removed. Needless to say, necrotic or ulcerating tumors were not cultured. Control tubes both with and without the kidney tissue and paraffin oil were routinely incubated with the cultures.

The ascitic fluid employed must be bile free, of good specific gravity and originally sterile. Fibrin content enhances the value of the media. Several hundred cultivation experiments have shown that not all specimens of ascitic fluid are favorable for the growth of the

[1]Rous, Peyton. Resistance to a tumor-producing agent as distinct from resistance to the implanted tumor cells. J. Exper. Med., 1913, xviii, 416-427; also 1910, xii, 696.

[2]Keysser, F. Uebertragung menschlicher maligner Geschwuelste auf Mause. Arch. f. klin. Chir., cxiv, 730-36.

organism in question. Moreover it would appear that storing the ascitic fluid in the ice-box for periods of several months enhances its cultural value. An original growth of the organism has never been obtained on solid media. Once a culture has been isolated in the kidney tissue ascitic media, it is usually possible to recover the organism in subculture generations where it grows with increasing ease after previous adaptation to artificial cultivation.

CULTURAL AND MORPHOLOGICAL CHARACTERISTICS

The peculiar micro-organism obtained from mouse carcinoma tissue exhibits the following growth characteristics. Commonly at the expiration of 48 to 72 hours' incubation, a distinct, grayish white opalescent halo appears about the carcinoma tissue at the bottom of the tube of ascitic fluid. Gentle agitation of the tube tends to increase the degree of turbidity while the uppermost limits of the cloudy zone remain sharply demarcated from the clear fluid above. Further incubation serves to increase the degree of turbidity. The control tubes of tissue ascitic fluid routinely incubated with the cultures remain brilliantly clear. Only after several weeks' incubation does a granular precipitate of tissue particles form in the bottom of the test tube.

Occasionally initial cultures after 4 to 7 days' incubation may exhibit a slight diffusion of turbidity into the uppermost portion of the media. After prolonged incubation a fine, powdery precipitate forms and slowly settles to the bottom about the tissue fragments. In old cultures the upper column of fluid may become clear again.

Subcultures are made by transferring from 0.3 to 0.5 cubic centimeters of the original culture pipetted from the bottom of the tube in close proximity to the tissue fragments into the next series of tubes. The initial changes in subculture generations are always more marked and the turbidity in the tissue zone exhibits a distinct tendency to rapid diffusion upward rendering the clear medium slightly turbid. Apparently this is but an expression of the gradual accommodation of the micro-organism to cultivation under artificial conditions.

Pure cultures of the minute micro-organism obtained from mouse carcinoma tissue present uniform morphological and cultural characteristics. Stained smears of the fluid from the bottom of the test tube after 5 to 7 days' incubation reveal many definite minute coccal and ovoid bodies arranged in pairs, short chains, and clumps. The organism stains best by Gram's stain or Giemsa stain. It is non-motile and not encapsulated. The minute bodies in young cultures are Gram positive, retaining the gentian violet dye. Other stains such as Loeffler's alkaline methylene blue, carbol gentian violet or carbol fuchsin all stain the organism without giving a sharp differentiation due largely to the intensive staining of the surrounding field.

The minute coccal bodies apparently develop within the carcinoma cells. Films prepared from the lower level of the tubes after previous maceration of the cancer tissue reveal numerous pairs and single bodies within the cancer cells—frequently as many as five to fifteen minute Gram positive organisms appearing within an isolated nest of carcinoma cells.

When stained by Giemsa solution the micro-organism appears considerably smaller than with the Gram stain. The purplish bodies vary in size depending on the age of the culture and the constituents of the media. Minute bodies averaging 0.1 to 0.3 of a micron in diameter predominate in early cultures. In old cultures or occasionally when the sample of ascitic fluid is unfavorable, larger forms appear in cultures approximating the staphylococcus in size. An intensive study of the morphology of this organism in many young and old cultures has shown that the micrococcus is extremely pleomorphic. Furthermore, there is evidence to support the view that the relative variation in the size of the coccal bodies depends largely on the varying degree of oxygen tension. In initial cultures in the tissue ascitic fluid, the small forms always predominate although a considerable variation in size may exist in the same culture tube. The larger bodies may represent degeneration or involution forms at the end of

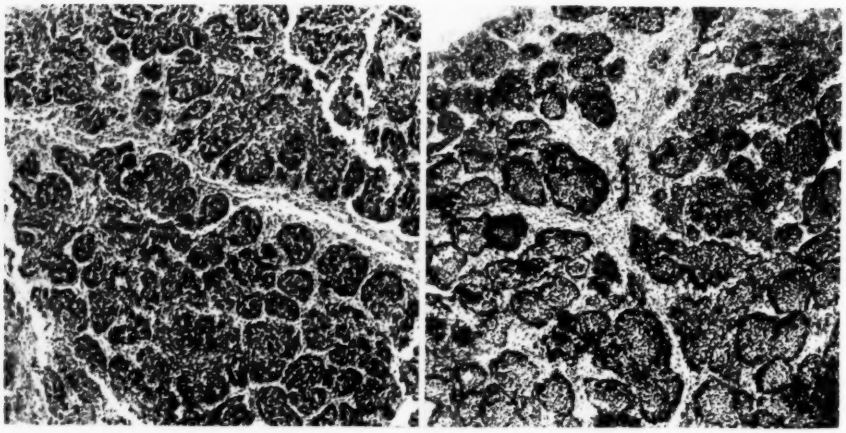


Fig. 1 (at left). Crocker mouse carcinoma No. 11 produced by inoculation of cancer tissue into the subcutaneous and breast tissues of a white mouse. (Low power magnification.)

Fig. 2. Mouse tumor 30 days after inoculation of pure culture of the micro-organism in the second subculture generation. Mouse No. 250. (Low power magnification.)

the life cycle of the organism. The smaller forms, many of them presumably submicroscopic in size, represent the micro-organism as it exists in the cancer cells in a pathogenic form.

Certain it is that subcultivation under partial anaerobiosis always effects a gradual diminution in the size of the coccal bodies until in cultures farther removed from the original growth many of the organisms come to retain the Gram stain with varying degrees of intensity.

Although an initial growth of the organism has never been obtained on solid media, it is usually possible to obtain a growth on solid cultural media after it is once established in the tissue ascitic fluid. In contrast with some of the filtrable viruses the micro-organism associated with mouse carcinoma may be readily subcultured from the tissue ascitic fluid under partial anaerobic conditions on to solid cultural media with free access of oxygen. It grows well on a medium composed of three parts of ascitic fluid plus one part of 2 per cent nutrient agar to which a fragment of sterile rabbit kidney has been added. After 3 to 5 days' incubation a cloudiness appears about the tissue fragment at the bottom of the tube and minute grayish colonies appear barely visible to the naked eye.

Subcultures on standard human blood agar plates appear as grayish white, pinpoint sized, colonies. Streak cultures on the same media exhibit an elevated, luxuriant grayish white growth not unlike cultures of the staphylococcus albus. After 24 to 72 hours' incubation a definite wide zone of hæmolysis is established along the line of growth.

From 14 different mouse tumors all produced by inoculations of cancer tissue emulsion or grafts in the usual manner, pure cultures of the micro-organism were obtained in eleven instances. The organism was isolated from one mouse tumor in association with staphylococcus pyogenes aureus and from a second mouse tumor the organism was cultured together with bacillus coli as a contamination. Of the eleven pure cultures, nine were isolated from early subcutaneous tumors varying in size from a hazelnut to a walnut. One pure culture was obtained from a carcinoma of the liver the size of a cherry. Still another pure culture was obtained from tumor growths present in the peritoneal cavity of a mouse receiving an intraperitoneal injection of tumor cell emulsion 40 days previously.

Subculture generations of the eleven different strains of the organism were inoculated into various culture media. On sugar broth none of the eleven strains attacked dex-

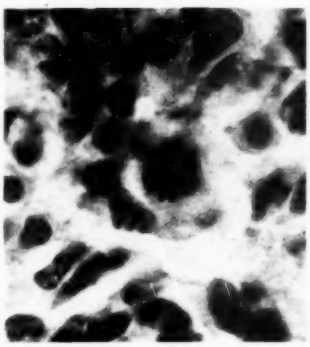


Fig. 3.

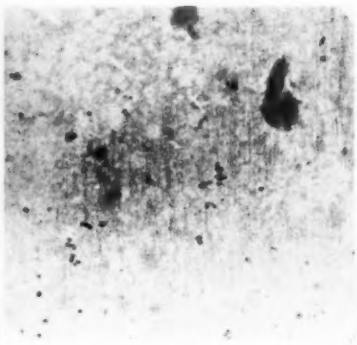


Fig. 4.

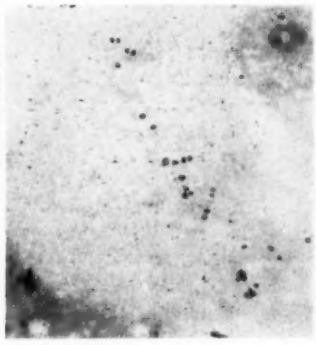


Fig. 5.

Fig. 3. Section of mouse tumor No. 250, showing type of cells and one central mitotic figure. (X1000.)

Fig. 4. First generation culture 16 days old of organism associated with mouse carcinoma. Giemsa stain. (X1000.)

Fig. 5. Seventh generation culture of the organism which has been isolated from mouse cancer tissue. Note that the organisms appear larger with Gram's stain. (X1000.)

trose, lævulose, or mannite. Two strains fermented salicin, raffinose, lactose and saccarhose. Four different cultures fermented inulin.

The organism multiplied in litmus milk without altering the appearance of the medium except in two instances where coagulation of the medium resulted.

Stab inoculations of gelatin with the eleven strains incubated at room temperature for 2 weeks gave varying degrees of liquefaction usually appearing after 3 to 7 days' growth as shallow crater-like zones of fluidification limited to the top of the stab.

Dextrose broth proved to be a favorable cultural medium in which a luxuriant growth developed with turbidity of the broth and the formation of a coarse, granular precipitate rapidly sedimenting to the bottom of the test tube.

When cultures of the organism are grown aerobically on solid media the organism appears considerably larger than in anaerobic cultures. In the tissue ascitic fluid media under paraffin oil, the organism is filtrable. It passes through Berkefeld and Mandler filters tested simultaneously against bacillus prodigiosus. The clear filtrate from subculture generations in the tissue ascitic fluid has in four out of five experiments yielded pure cultures of the minute organisms upon reinoculation into tissue ascitic media overlaid with paraffin oil. Under these conditions growth is slow and appears after 5 to 8 days' incubation as an opalescent zone about the kidney fragment in the bottom of the tubes. Solid media inoculated with the same filtrate under aerobic conditions has never yielded a growth.

EXPERIMENTAL INOCULATION OF MICE

The minute micrococcus described above is present so constantly in the cancer tissue of inoculated mice as to suggest that this micro-organism might possibly play some important rôle in the riotous overgrowth and lawless proliferation of the carcinoma cells. Whatever may ultimately be shown to be the significance of the organism, the important question at hand is whether or not cultures of the micro-organism are capable of reproducing new tumors when inoculated into mice.

Before recording the several successful inoculation experiments, it seems desirable to discuss briefly certain important points. It is known that tumor tissue rapidly loses virulence when exposed to room temperature for periods of several hours. We have repeatedly observed complete loss of virulence after exposure of cancer tissue or emulsion of tumor cells to incubator temperature for periods of 12 to 24 hours. Repeated filtering of a saline

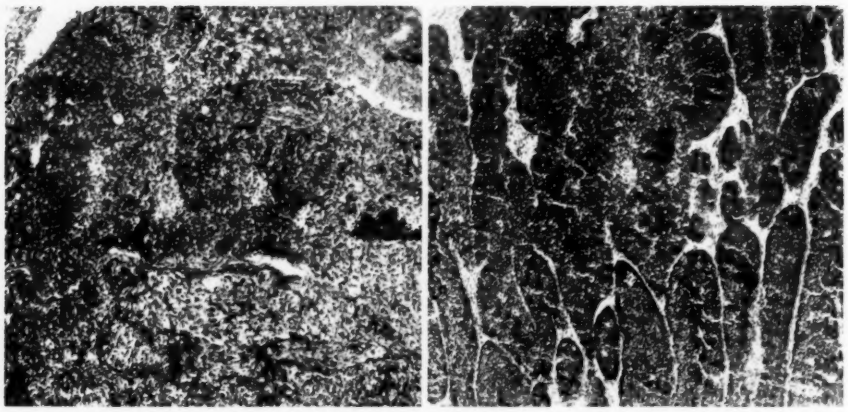


Fig. 6 (at left). Mouse carcinoma 40 days old resulting from inoculation of an emulsion of cancer cells plus culture of the micro-organism. Note change in histological structure of the tumor. (Low magnification.)

Fig. 7. A rapidly growing mouse carcinoma resulting from injection of the micro-organism into and adjacent to a well established graft carcinoma. Tumor 20 day's old in second transplantation.

emulsion of the tumor cells through filter paper results in complete loss of virulence. Exposure to a temperature of 50° C. in the water bath completely destroys virulence in 5 to 10 minutes.

Jensen was able to reproduce new tumors in mice after preservation of the sterile tumor tissue in the icebox for 18 days. And Ehrlich was able to reproduce new tumors in mice by inoculation of the sterile tumor tissue after preservation for 1 year in the icebox.

Since incubation of carcinoma cells or exposure to room temperature for relatively short periods of time occasions rapid or complete loss of virulence, we must assume that either the cells die or an organism associated with the cells loses rapidly in virulence or that both factors are in part responsible. Accordingly we were prepared to encounter difficulties in producing tumors with pure cultures of the organism isolated from the cells. Inoculations of cultures into many mice have resulted in the formation of tumors growing to the size of a pea or larger and slowly regressing in large percentage of animals injected. Especially is this true with cultures farther removed from the original source than the second or third subculture generation. Hence it follows that the multiplication of the organism under artificial conditions results in a rapid loss of virulence.

In order to get the tumor to its maximal degree of virulence or adaptation, a heavy sterile saline emulsion of tumor tissue was inoculated into a series of mice. Portions of these tumors were removed sterilely under ether anæsthesia and the remaining tumor cells traumatized. The skin incisions were closed with continuous silk sutures. A rapid recurrence of the growth resulted. The tumors operated upon eventually reached a size equal to half the body weight of the animal, spreading by infiltration from the abdomen and groin up over the back and on to the neck of the mouse. The same operative procedure was repeated in a second series of mice inoculated with tumor emulsion prepared from the preceding animals. All of the mice inoculated were obtained from the same dealer and were of the same stock.

The mice of the second generation passage were etherized when the tumors measured 1 to 2 centimeters in diameter. Pieces of this tumor tissue were removed aseptically and inoculated into ascitic tissue fluid media overlaid with paraffin oil. After 5 days subcultures were made and four mice of the same stock received multiple inoculations of the

organism into the groins and axillæ. The protocols follow:

Experiment 1. March 3, 1921. 5:00 p. m. (*Mouse No. 250*). Four mice received subcutaneous inoculations in the groin and axilla of the second subculture generation of the micro-organism.

March 10: Tumors were present in all four mice; the smallest was the size of a BB shot and the largest was equal in size to a split pea.

March 14: In two of the mice the tumor nodules had completely retrogressed. In a large pregnant female (Mouse No. 250) a pea-size nodule was palpable in the right groin.

March 18: The above tumor had grown to the size of a cherry. The animal had given birth to five mice.

March 22: A second pea-size tumor was palpable in the left axilla.

March 30: The mouse had three rapidly growing tumors, one in each groin and a third in the right axilla at all three points of inoculation of the culture.

April 2: The first tumor had grown to the size of a walnut and completely raised the animal's hind leg off the floor of the cage. Animal etherized and photographed. Cultures of the tumor tissue yielded pure growths of the original micro-organism injected. Microscopic sections prepared from these three tumors reveal typical alveolar carcinoma identical histologically with the original carcinoma.

Control inoculation A, March 3, 1921, 5:30 p. m. Fragments of the same tumor tissue from which the previous culture was obtained were inoculated into tubes of ascitic fluid under aerobic conditions. After incubation at 35° C. for periods of 24, 48 and 72 hours, three series of normal mice received multiple injections of a heavy saline emulsion of the incubated tumor tissue. The first three mice were inoculated after 24 hours' incubation of the tumor tissue; the second batch after 48 hours, and the last lot of three mice received the emulsion of cancer cells after 3 days' incubation in sterile ascitic fluid. In none of the inoculated mice did tumors appear during 6 weeks' observation.

Control inoculation B, March 3, 1921, 5:30 p. m. Two normal adult mice received inoculations with fresh saline emulsion of tumor cells from the same tumor used in Experiment 1 and developed rapidly growing cancers which caused the death of the mice 5 and 6 weeks respectively after the inoculations.

From the control experiments it will be noted that incubation of the fresh tumor tissue for periods of 24, 48, and 72 hours resulted in a complete loss of virulence since no tumors developed in the inoculated mice. That the tumor tissue in the fresh state was active is shown by the rapid growth in the last two mice of this series.

Experiment 2, April 2, 1921, 4:00 p. m. Twelve young, white mice were inoculated subcutaneously in the groins and axillæ with a saline emulsion prepared from the tumor tissue of mouse No. 250.

April 9, 1921: Two mice of the above lot had palpable tumor nodules the size of a BB shot.

April 19th: Eight of the ten mice living had developed one or more palpable tumors. The largest tumor measured 1.5 centimeters in its opposite dimensions. The smallest tumor was the size of a pea. One mouse had four different tumors.

April 25th: One mouse found dead in cage with a tumor in each groin. The largest nodule had a maximum diameter of 2.5 centimeters. Sections prepared from this tumor reveal a histological structure identical in appearance with the original Crocker carcinoma No. 11. Cultures from several tumors gave pure growths of the micro-organism originally injected into mouse No. 250 in Experiment 1 above.

From the experiments detailed above it is obvious that injections of the micro-organism in the second subculture generation produced three tumors in mouse No. 250. As further proof that these tumors were genuine mouse carcinomata, inoculations of this tumor tissue emulsion yielded 80 per cent of tumors in experiment No. 2. Cultures of the latter yielded pure growths of the organism originally injected into mouse No. 250.

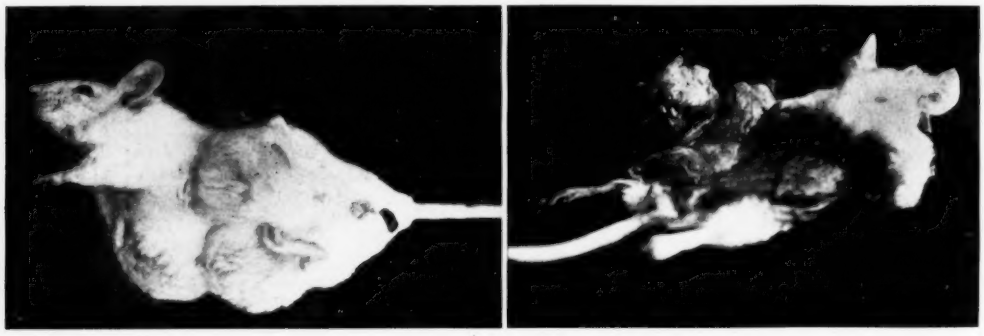
To determine how long a time cultures of the organism retained virulence sufficient to reproduce progressively growing tumors in mice, the following experiment was made:

Experiment 3, March 19, 1921, 12:00 noon. Four mice received multiple subcutaneous injections of a 16-day-old anaerobic culture of the micro-organism in the first generation. Tumors appeared in all three mice and slowly regressed in two. In the third large mouse (gentian mark on back) pea sized tumors were palpable in each groin March 28. These nodules enlarged slowly.

April 6th: The mouse was killed and microscopic sections were prepared from the largest tumor nodule. Typical nests and columns of epithelial cells surrounded by a scanty connective tissue stroma.

This observation suggests that the micro-organism after a period of incubation of but 16 days in the tissue ascitic fluid media retained sufficient virulence to reproduce a slowly growing tumor the size of a pea 18 days after injection into the mouse. The low percentage of takes (25 per cent) might indicate that the micro-organism had lost largely in virulence although in the original first generation culture.

An attempt was made to determine the effect of inoculation of a mixture of fresh can-



Figs. 8 and 9. Mouse No. 250. Three tumors resulting from inoculation of the second subculture generation of the organism.

cer cell emulsion plus equal parts of a culture of the micro-organism. Inoculations were made into three series of mice as follows:

Experiment 4, January 6, 1921, Series A. Five mice were inoculated subcutaneously with a mixture consisting of equal parts of fresh cancer cell emulsion and a 2 months' old culture of the micro-coccus isolated previously from tumor tissue.

January 26: Large tumors in all of the above mice. Largest tumor measured 1 by 2 centimeters in its opposite dimensions.

February 13: Mouse with largest tumor found dead in cage. Large firm tumor measuring 4 by 2.5 centimeters in its opposite dimensions. A tumor nearly half as large as the body of the mouse after 38 days' growth. Many miliary metastases in the liver.

Series B. Five mice of same lot inoculated with small fragments of same tumor used above by trocar method.

January 18: All mice developed small tumors but in three animals the grafts had completely regressed.

January 25: Small slowly growing pea-size tumors present in two of the five mice—40 per cent takes.

Series C. Five mice of same lot received inoculations of same tumor cell emulsion into groins and axillæ.

January 26: Large tumors in all these animals. Largest growth measured 2 by 1 centimeter in its opposite dimensions.

An analysis of this small series of mice all inoculated with the same tumor tissue at the same time gave a yield of 40 per cent of tumors with trocar inoculations of small fragments of tissue. Emulsions of the tumor tissue in five mice gave 100 per cent takes with rapid growing carcinomata.

Of five mice receiving a mixture of cancer-cell emulsion plus culture of the micro-organism, tumors of rapid growth appeared in 100 per cent. In one animal the growth equalled half the body weight 38 days after inoculation. At autopsy this tumor was of firm consistancy exhibiting no tendency toward ulceration. Many miliary metastases in the liver of the mouse.

An attempt was made to determine the effect of injection of cultures of the organism into and adjacent to tumors produced by inoculation of cell emulsion in the usual manner.

Experiment 5, February 8, 1921. A batch of eight mice was inoculated subcutaneously with saline emulsion of cancer tissue.

February 23: Six of these mice had growing tumors. The largest measured 1 centimeter in its opposite dimensions. The mice were divided into two lots as follows:

Lot A. Three tumor-bearing mice received injections of the organism isolated from tumor tissue into and adjacent to the tumor nodule.

February 28: The tumors were enlarging rapidly. Mouse with largest tumor etherized and the growth was removed aseptically. It was soft, extremely vascular and friable. See photomicrograph. Stained contact smears prepared from this tumor revealed myriads of organisms in and between the cancer cells. Two mice inoculated with an emulsion of this tumor developed extremely rapid growing cancers. The largest measured 2 by 2.5 centimeters sixteen days after inoculation. The smallest growth was hazel nut size.

Lot B. Three tumor-bearing mice received injections of an old stock culture of staphylococcus albus into and adjacent to the tumor nodule. The growths remained stationary, slowly softened and ulcerated in two of the mice. The third mouse died 2 days after injection. Inoculations of tissue fragments from one of these soft tumor nodules failed to reproduce tumors in any one of six mice which were under observation for a period of 6 weeks.

Summarizing the experiment above it might be assumed that injections of the organism into and adjacent to well established, active, growing carcinomata result in an increased rapidity of growth. A detailed investigation of this point might profitably form the subject of a separate paper.

Injections of staphylococcus albus resulted in an apparent retardation of tumor growth with early necrosis and ulceration. Fragments of the tumor tissue so contaminated failed to reproduce new tumors on subsequent inoculation into six normal mice.

DISCUSSION

The writer has made an intensive study of a transplantable carcinoma of the white mouse known as the Crocker carcinoma No. 11. This investigation has extended over a period of more than 2 years, involving several hundred cultivation experiments with cancer tissue in the special tissue ascitic fluid media. More than twelve hundred white mice were inoculated with cultures and tumor tissue. The investigation has been entirely limited to the same mouse tumor received on four different occasions from the Crocker Research Fund through the kindness of Dr. F. C. Wood.

Employing the special tissue ascitic fluid media under partial anaerobic conditions, a minute, filtrable, Gram positive micrococcus has been isolated quite constantly from emulsions or pieces of carcinoma tissue removed under sterile precautions. The minute coccal bodies present some difficulty in isolation in the original cultures but transfers to subculture generations gradually effect a more rapid and luxuriant growth once the organism becomes adapted to artificial cultivation. It has been carried to the twelfth subculture generation under anaerobic conditions. The minute micro-organism has been seen in stained sections of early carcinoma produced by trocar inoculation of tissue grafts in the usual manner. It has been frequently demonstrated in contact smears of carcinoma cells stained by Gram's method. It has never been encountered in the many control tubes of culture media incubated simultaneously with the cultures.

The organism is present so constantly in this transplantable carcinoma of the mouse that one may or may not be justified in assuming that it plays some important rôle in the propagation of this tumor. One might assume that the minute coccal bodies invade the cancer cell and are carried along with them, acting possibly as a continual irritant to the cell nuclei resulting in limitless division and multiplication. If this assumption is correct we must conceive of two factors or agents responsible for the growth of this mouse tumor, the cancer cell itself and the minute micro-organism present within the cells.

Injections of pure cultures of the organism subcutaneously in the breast tissues of mice have in many instances reproduced tummor nodules which grow progressively for periods of 10 to 30 days and slowly regress in the majority of cases. Microscopic sections of such tumor nodules removed at 24 hour periods reveal a mass of newly formed tissue cells rapidly dividing and supported by a newly formed stroma which becomes vascularized.

By stimulating the tumor cells to their maximal degree of virulence either by incomplete surgical removal with recurrence of the tumor followed by rapid passage through a series of mice of the same stock or, by injecting cultures of the organism into growing tumors followed by transplantation, a method has been found whereby pure cultures of the organism have reproduced new-growths.

Subcutaneous injections of anaerobic culture of the minute organism under these favorable experimental conditions, designed to exclude the probability of carrying over living cancer cells, have in several isolated instances led to the production of tumors which grew steadily producing cachexia of the mouse. Histological studies have shown that these tumors do not vary in structure from the original growth known as the Crocker carcinoma No. 11. Transplants from the tumor growths produced by injections of the organism have yielded similar growths in 80 per cent of a series of inoculated mice. The organism has been readily recovered from these experimental tumors.

Inoculation of cultures into and adjacent to tumors appear to stimulate the growth and enhance the virulence of the tumor tissue in subsequent transplantation.

In contrast to these observations, control injections of a limited number of cultures of staphylococcus aureus and albus, bacillus prodigiosus, and streptococcus hæmolyticus into normal mice have never in the author's experience reproduced tumor growths, abscess formation or septicæmia being the usual result.

Furthermore, when active cancer cells are mixed with cultures of ordinary bacteria, inoculations in mice usually fail to give a "take."

Finally, it should be clearly stated that the author makes no claim of having discovered the cause of cancer. The association of the minute micro-organism with the cancer cells of the transplantable mouse carcinoma suggests that further careful study be made of this organism. While it is theoretically possible that living cancer cells may have been carried along in subcultures, the observations recorded suggest that two agents may be concerned in the etiology of this mouse carcinoma; the first agent being the minute coccal bodies stimulating the cells to rapid division, and second, the cancer cell itself closely associated with the organism and transmitting it from host to host in subsequent transplantations.

The difficulty of reproducing new carcinoma by inoculations of the organism into normal mice might find its parallel in the same difficulties observed in attempting to establish spontaneous tumors of the mouse in other normal mice.

Experimental observations have shown that many spontaneous mouse tumors cannot be transplanted into normal mice. With other spontaneous tumors when inoculated into a large number of mice, commonly only 2 or 3 per cent of the original grafts survive. It is logical to presume that the same difficulties might exist in attempting to establish new tumors by injections of pure cultures of the organism into normal mice. In only three of a series of 89 normal mice so inoculated with cultures has the writer been able to establish progressively growing tumors which on removal presented the typical histological structure of the original mouse carcinoma and were transplantable into other mice. Possibly, repeated injections of cultures over a considerable period of time might serve to increase the number of successful takes. The degree of natural immunity or resistance of the normal host to cancer implantation offers factors far too subtile for explanation at this time.

Recently the writer had under his care a patient with an early carcinoma of the breast. The patient had noted the presence of a walnut sized tumor in the upper, outer quadrant of her breast present for the past 4 months. A radical amputation was performed. The carcinoma nodule was cut into pieces and cultured in the ascitic fluid tissue media. In each of four tubes so inoculated a pure culture of an organism presenting the same cultural and morphological characteristics was isolated. Since this observation the same organism has been cultured from the ascitic fluid of a carcinomatosis of the peritoneum, from a metastatic carcinoma nodule of the omentum secondary to a primary growth in the sigmoid and from a second human breast cancer. The cultural characteristics are identical with those of the organism isolated from the mouse carcinomata. An intensive bacteriological study is being made of the large number of cancer patients presenting themselves for surgical treatment at the clinic of Dr. A. J. Ochsner at the Augustana Hospital, Chicago.

However, it is of the greatest importance to determine whether or not an organism exists in human cancer similar in its cultural and morphological characteristics to the minute micro-organism found in this transplantable carcinoma of the white mouse.

THE INCIDENCE OF CARCINOMA IN GASTRO-INTESTINAL DIVERTICULOSIS

Detailed Report of a Case of Gastric Diverticulosis

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IT is not our intention to discuss with any degree of completeness the literature of this subject, nor to dwell at length on the clinical side of most of the cases discussed. McGrath (1) and W. J. Mayo (2) in their excellent papers have substantially considered these phases of the subject. The gastric case, however, for reasons which will be obvious, will be presented in full.

Since the organization of the pathological department in this hospital 4 years ago, four cases of diverticulosis have been encountered, one of which was at autopsy. The last mentioned case had undergone an operation for another abdominal condition, at which time the surgeon had noted, in the wall of the sigmoid close to the mesentery, twelve to fifteen pea-sized nodules which he was unable to interpret. These proved to be multiple diverticula filled with fæcal material. This case belongs to the symptomless, incomplete variety of the acquired type of this condition. Of the three other cases, two were located in the sigmoid, where they caused intestinal obstruction; the third was in the stomach and was associated, at least, with very definite symptoms, whether it actually produced them or not.

As regards malignancy, the four cases present a graded series. The multiple diverticula of the case which came to autopsy showed no evidence of carcinoma; the gastric diverticulum showed precancerous lesions; one of the sigmoid cases after thorough search revealed a very early carcinoma, and the other showed a carcinoma far advanced.

The clinical history of the two sigmoid cases was essentially that of intestinal obstruction. The cases were diagnosed pre-operatively as carcinoma of the sigmoid. These two patients were respectively 54 and 69 years of age. The elder died about a year after operation, of what was clinically generalized carcinomatosis. No autopsy could be obtained. The younger is still living and well, more than 2 years after operation. These cases were operated upon by W. Frank Fowler, of the surgical staff of this hospital.

On account of the rarity of the gastric type, and because of other features of interest presented by this case, it seems desirable to report it quite fully. Buschi (3) regards this type as of less common occurrence than diverticulosis in any other portion of the gut. It is of interest that this order of frequency is reversed in some of the lower animals. In the pig, for example, diverticulosis most commonly occurs in the stomach and usually near the cardiac orifice.

Of the few cases reported, Keith's (4) two were located near the cardiac orifice, while Falconer (5) reports one found in the pyloric end. Carman and Miller (6) report one in which they found evidence of well marked carcinoma in the outer half of the diverticulum. No cases were encountered in the literature where diagnosis was made pre-operatively and verified at operation.

Our patient, C. M. C. of this city, consulted his physician on account of persistent loss in weight. He was referred to one of us (Soble) by Dr. Thomas Jameson and presented himself for examination on September 18, 1919.

The patient's father died at the age of 63 from some form of "splenic" disease; mother and three sisters are living and well. There is no family history of carcinoma or of tuberculosis.

The patient had always previously enjoyed the best of health except for two attacks of bronchopneumonia, from which he had entirely recovered. He denied venereal infection.

Present illness. He began to lose weight about 5 months previous to the date on which he presented himself for examination; whereas his best weight had been 168 pounds, he now weighed 137 pounds. His appetite, which had always been of the best, had remained unaffected. He complained of a tired

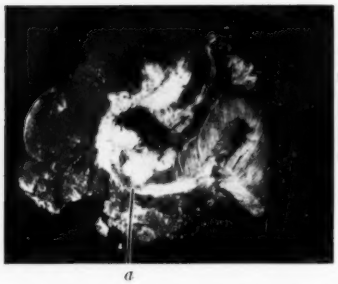

Fig. 1 (at left). Diverticulosis of the sigmoid. Diverticulitis and peridiverticulitis present. Note early carcinoma at *a* invading muscle wall. Note also obliquity and separation of muscle bundles. About three-fourths natural size.

Fig. 2. Same as Figure 1, but printed to show the diverticulum at *a* and the fold of reflected mucosa in its center. Note large mass of fat around periphery of most of the section.

feeling in the morning and recently had worried considerably about his work. He attributed this to the fact that he had not had a vacation since 1918. He complained also of pressure and fullness in the region of the stomach. There was belching, but no nausea or vomiting. He had been occasionally but not chronically constipated. He had suffered no pain.

Physical examination. The patient was a well nourished male, 49 years of age, and married. He had been employed in a large machine shop. He appeared in robust health. His pupils were equal and accommodation normal. The only abnormal findings were suspicious looking teeth and a small ulcerated area on the left side of the nasal septum. Examination of the heart and lungs was negative. The abdominal examination was negative and there was no evidence of pain anywhere, even upon pressure. No developmental defects were observed on external observation.

Blood examination. Hæmoglobin (Tallquist) was 100 per cent; red blood count 5,100,000; white blood count 10,000. Differential count: polymorphonuclear 73 per cent; large lymphocytes 7 per cent; small lymphocytes 16 per cent; eosinophiles 2 per cent. Blood pressure was 120 systolic and 80 diastolic. The Wassermann reaction on September 27 was negative with both antigens.

Urinalysis. The urine was negative.

Gastric analysis. Patient had had no breakfast. Upon passing the stomach tube a 20 cubic centimeter residue was obtained, which on analysis gave the following data: color, lemon; odor, offensive; consistency, very thick; reaction to litmus, acid. Free hydrochloric acid was present, but no estimation was made of the amount. There is no report of a test for blood having been made at this time. An examination of Ewald's test meal, withdrawn 50 minutes after ingestion, shows: free hydrochloric acid, 49; total acidity, 60, with a positive blood reaction to the benzidine test. Microscopic examination showed the presence of a few starch granules, a few Boaz-Oppler bacilli and many red blood cells. An examination of the morning residue the following day, for blood, with the benzidine test, gave a positive reaction.

Roentgenological examination. Patient was allowed to swallow 16 ounces of fresh buttermilk containing 4 ounces of barium sulphate in suspension. A fluoroscopic examination was made with the patient in the erect position. There was no obstruction to the passage of the meal into the stomach. The stomach itself presented a picture characteristic of the organ in its hypotonic state, but it was normal in size. Its position was to the left of the median line. Moderately active peristaltic action was observed. The outline of the greater curvature showed a T-shaped evagination protruding from the greater curvature at about the junction of the pars cardia with the pars media (Fig. 6). The duodenal cap was visualized directly over the spinal column and seemed regular in outline. There was no evidence of adhesions.

A series of plates taken within 1 hour after the ingestion of the barium meal showed a pouch, apparently regular in outline, extending outward from the greater curvature of the stomach, nearly opposite the cardiac opening and connected with the stomach proper by what appeared to be a narrow isthmus or pedicle.

A diagnosis of diverticulum of the stomach was made; in view of the clinical history of the patient and the chemical and microscopic findings of the gastric contents, early malignancy was suspected. Surgical interference was advised, and on September 26, 1919, Dr. Thomas Jameson removed the section of the stomach to which the diverticulum was attached. At the time of operation, it was observed that the intact mucous lining of the stomach was grayish-white in color and that it separated very easily from the muscular wall.

The resected portion of the stomach measured 5 centimeters in diameter. The diverticulum itself would just admit the thumb and had a depth of

Fig. 3. Cross section of diverticulum. Carcinomatous area in upper left-hand corner. Micro tessar 48 mm. x 10.

1.5 centimeters. The neck was somewhat constricted by a thickened ring, due perhaps to a retraction of the muscle bundles which apparently had disappeared from the tip of the evagination. A congested dark area was present over the distal portion of the structure. A thickened, somewhat granular mucosa was intact over the entire surface of the specimen.

Microscopic examination confirmed the macroscopic appearance of mucosal integrity and showed, in addition, a marked superficial, round-celled infiltration, generally and rather diffusely distributed. The gland cells were quite hyperplastic, and the lumen of some was so dilated as to suggest retention cysts. In places the dilatations were engorged with polymorphonuclear cells. The deeper levels of the mucosa of the diverticulum disclosed numerous tubules, the cells and nuclei of which were very hyperchromatic and approached very closely the type of change seen in tubules of Figure 2. The arrangement and morphology of the cells so closely parallels that seen in transition areas of the carcinomatous sigmoid case (Figs. 2 and 3) that we felt justified in designating the lesion as precancerous.

The dark area seen at the distal extremity of the pouch is easily explained microscopically by the marked congestion of the small vessels, and recent extravasation, in addition to an older extravasate in the adjacent muscle bands, which are hæmatoidin stained. It is of note in this area of separation of the muscle bundles that several fairly large vessels were present. The muscle bundles show a separation and direction somewhat comparable with that seen in the sigmoid cases.

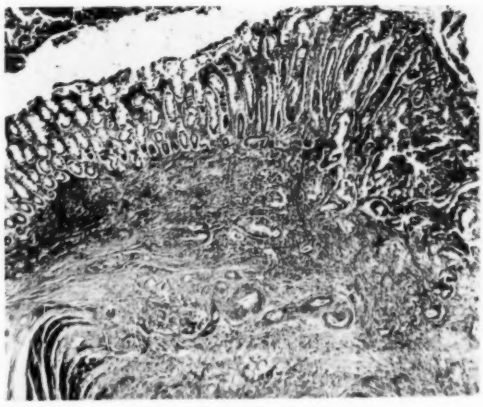

Fig. 4. Normal mucosa at extreme left with progressive increase of atypical tubules merging into carcinomatous area at extreme right of picture. Micro tessar 48 mm. x 25.

Of considerable interest and importance is the probability that carcinoma may begin in the diverticula without ulceration of the mucosa. In one of the sigmoid cases this seemed highly probable, but in the other it seemed rather probable that ulceration had preceded the malignancy, inasmuch as the process was well marked in many areas of the tissue, while the carcinoma was located in one area only.

We shall now proceed to some of the pathological details of one of the sigmoid cases, in which malignancy appeared to begin on a mucosa free from ulceration. The specimen as it came from the operating room was roughly circular in shape, lobulated, fatty, and presented a mottled hæmorrhagic appearance. It measured 8 centimeters long, 5 centimeters wide, and 3.5 centimeters thick. It was only after sectioning the entire tissue and carefully examining each gross section that one with a suspicious area was found. This manifested itself by an interruption in the integrity of the mucosa, which in other places was sharply delineated from the underlying muscle.

The area referred to is seen at *a*, Figure 1, its limiting margin presenting a scalloped appearance where it has become invasive. Careful search of this diverticulum reveals a mucosa practically intact—even where the latter is definitely malignant—with the exception

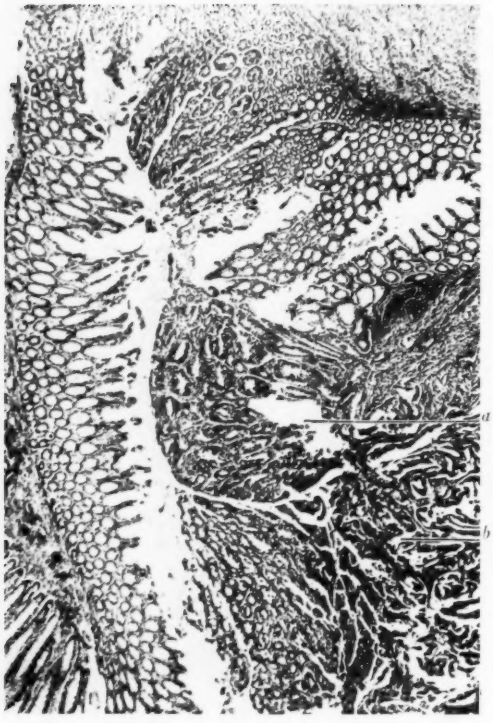

Fig. 5. The vertical lumen of the diverticulum separates normal mucosa at the left from atypical mucosa at *a*, which is definitely invasive at *b*. Micro tessar 48 mm. x 25.

of one point, where a superficial ulceration is present. This, however, is of recent occurrence and probably secondary, as is implied by the presence in the slough of portions of the carcinomatous glands.

Figure 4 is of interest as showing the steady increase of atypical tubules from left to right until the definitely carcinomatous area at the extreme right of the picture is seen. The atypical character of the cells was recognized in part by their very hyperchromatic nuclei, noticeable particularly in the lower levels of the affected glands. This abnormality, however, does not respect even the superficial portion of the tubules as the carcinomatous portion of the tissue is approached. The contrast between normal and carcinomatous tubules is further shown in Figure 5. At point *a* this very atypical mucosa with the hyperchromatic cells is continuous with the adjacent area, *b*, which is still more hyperchromatic; in fact the latter is definitely carcinomatous and is in part identical with the invasive area, as seen in Figure 1 at *a*. The left side of Figure 5 shows a perfectly normal mucosa. It is to be observed that all the mucous surfaces of Figures 4 and 5 are not ulcerated.

A well-marked, round-celled infiltration is present throughout the diverticulum, being particularly well marked in the atypical portions. It is also present beyond the muscle walls, in some granulomatous tissue—peridiverticulitis. In Figure 1 the angulation of the muscle walls, together with the obliquity and abnormally separated muscle bundles, is conspicuous. It is of note that all layers of the gut participated in the angulation process, but the mural layers, although everywhere present, did not always follow the tortuosities of the mucosa. The spaces enclosed by the sinuosities of the latter were usually shown to have definite connection with the lumen of the intestine.

DISCUSSION

McGrath speaks of two general classes of diverticula: (1) the congenital, and (2) the acquired. The prototype of the former is exemplified by Meckel's diverticulum, which is recognized as a developmental defect. McGrath says further that it has been suggested that certain of the acquired variety are in a certain sense congenital. Buschi (*loc. cit.*) in his analysis, is also a strong exponent of their congenital origin.

It is, indeed, difficult to explain satisfactorily the pathogenesis of this condition if we leave out of consideration entirely, congenital structural defects. True it is, the literature affords us a galaxy of supposed etiological factors, from which it would seem that the most fastidious might extract a combination adequate for each and every case; but, short of an unusual concatenation of circumstances, it is hard to assign to any of them more than a contributory rôle.

Among the causal factors cited by McGrath are the following: (1) obesity, (2) cachexia

and absence of fat, (3) a previous state of obesity and subsequent wasting, (4) normal structure of the large intestine, (5) physiological rôle of the sigmoid flexure, (6) intra-intestinal pressure, and (7) muscular deficiency of the intestinal wall.

Of the acquired diverticula, two types have been recognized: (1) the incomplete, which involves all the intestinal layers except the muscular. This, the most common form, is also spoken of as "hernia mucosæ" inasmuch as it is essentially an evagination of the mucosa through a "locus resistentiæ minoris." The other variety of the acquired type involves all the layers of the intestinal wall and is exemplified in the two sigmoid cases. The gastric case is of the incomplete variety.

The point which we wish to stress is the apparent predilection of this condition for the development of carcinoma. From the clinical standpoint, this is one of the soundest arguments for its early apprehension and proper treatment. Of a total of 27 sigmoid cases, McGrath records 7 of carcinoma (25.9 per cent) but states that "all of these cases were of advanced peridiverticulitis" which should be distinguished from the incidental, symptomless variety encountered at autopsy. Inclusion of such cases would, of course, lower the percentage materially and give a false conception of the frequency of malignancy where the condition is clinically significant.

In explanation of the frequency of malignant transformation in these cases, it is noteworthy that an apparently significant combination of contributory causes is here present. In support of the theory that "tissue tension alteration" is an important factor in neoplastic initiation, it would appear that in diverticulosis we have an example *par excellence*.

In the "complete" type of this condition, the labyrinthine windings of the mucosa, together with the obliquity and consequent separation of the muscle bundles, bear testimony to the interstitial strains that must be the resultant of these processes. And in a mucosal hernia as it exists in a viscus, more or less constantly contractile, interstitial strain must again be unavoidably associated with the histopathological changes in evidence, viz., passive congestion, hæmorrhage, and dilatation of the incarcerated gland structures.

Fig. 6. Roentgenogram of stomach with gastric diverticulum at *a*. Reduced to about one-third original size.

Nutritional disturbances are the logical sequel of this mechanical stress, which in their turn invite infection, a factor of neoplastic importance. It was of note that the Boaz-Oppler bacillus was present in the gastric case, although no definite carcinoma could be demonstrated. Accepting the fact that this organism is frequently associated with gastric cancer, its presence is entirely congruous with the assembled evidence. It would seem, then, that a high percentage of cancer might well eventuate under conditions so favorable for the interplay of two factors the appraisal of which, in a neoplastic sense, has always been so high.

CONCLUSIONS

Gastro-intestinal diverticulosis is an important abdominal condition which does not have the recognition from the abdominal surgeon that it deserves. The gastric cases are the rarest. The one here reported was diagnosed pre-operatively by means of the X-ray, and confirmed by pathological examination.

The conditions prevailing in these curious formations seem to facilitate the development of carcinoma, which fact makes their early recognition and removal a matter of first importance to the patient. Ulceration is not a necessary condition for the development of carcinoma.

Whether carcinoma develops or not, diverticula are always a source of danger to the patient, owing to the sequelæ of infection and obstruction.

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RANULA OF BRANCHIAL ORIGIN[1]

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In confirmation of some recent contributions to the subject of ranula by Skillern, Lewis, and Thompson, the following is offered as an analogous case.

A. J., 29, Austrian, housewife, first consulted me about the middle of July, 1920, with a visible swelling in the left cervical region and a swelling under tongue, both of which she had had for 3 weeks. Her family and past history were irrelevant. In January, 1920, she noticed a small swelling to the left of the under surface of the tongue, which gradually increased in size and was slightly painful. In about 10 days she also developed a swelling in the left submaxillary and cervical regions, which also gradually increased in size until both swellings caused her difficulty in talking and deglutition. These were slightly painful and tender, because of which reasons she consulted a surgeon, who, 3 weeks after the inception of her illness (January 28), under a general anæsthetic, "excised" the swelling under the tongue. The swelling in the neck disappeared and the patient was well for 2 weeks, when she had a second operation in the mouth (February 14) for a recurrence of the swelling. Thereafter, she was well for 3 weeks, but then began to drain a mucinous fluid through the mouth until the onset of her present illness. For about 3 weeks she had the initial gradual increase in size of the swelling of the neck and under the tongue. The general physical examination was negative, except that she was very nervous, rather pale, and had several bad teeth. The urine and Wassermann were negative. Local examination revealed a typical ranula to the left of the frenum of the tongue about the size of a walnut, which was very tender. In the left submaxillary and upper cervical regions there was a semi-elastic, fluctuating swelling which was very tender, not attached to the skin, and not movable on the deeper parts. Pressure over it caused a slight increase in size of the ranula and the production of a transmitted fluid wave. We then apparently had to deal with a ranula which communicated with a cyst in the neck.

Operation, July 14, 1920. The patient would not take a general anæsthetic, so, under local 2 per cent novocaine anæsthesia, the ranula was excised. At the floor of the mouth, to the left of the frenum, there was seen a small sinus which admitted a fine silver probe. By pressing on the cervical swelling, there could be expressed through this opening about 8 ounces of brownish, thick, mucinous material. Insertion of a probe through the opening carried it posteriorly about 4 inches and almost to the parotid region. Under these manœuvers the swelling in the neck collapsed to a level with the skin. The patient obtained almost immediate relief, but in 2 days returned with a recurrence of the swelling in the neck. Examination revealed that the communicating sinus had closed and that the cervical cyst completely filled the submaxillary triangle and was very tender.

Operation, July 16, 1920. Under local anæsthesia a 3.5-inch incision was made parallel to the left mandible, and about 1 inch beneath it. The platysma was incised, the submaxillary gland retracted, and there was exposed the cyst wall. It was very thin, looked just like a "frog's belly," and was intimately adherent to the surrounding structures. With a very nervous patient, no very extensive dissection of the cyst wall could be made. About as much as would cover a silver dollar was removed with the efflux of a large quantity of the same brownish mucinous material which we had encountered previously. Insertion of the probe could only be made in two directions; one, the submaxillary region, and the other, in the direction of the parotid

[1] Presented at the Metropolitan Medical Society, New York, November 30, 1920.

region. It was clear that an obliteration of the cyst cavity would have to be attempted by the introduction of irritants. Accordingly, the cyst lining was swabbed with pure carbolic acid and immediately followed by swabbing with alcohol. A packing, impregnated with a mixture of iodine, carbolic, glycerine, and water was introduced into the two cavities; one the submaxillary, and the other, the upper cervical. The skin was closed with interrupted sutures. For 10 days the cavities were repacked daily, and at the end of that time granulation was complete and the wound was firmly healed. During the first 6 days, there was profuse drainage of cyst content. The patient was free from all pain. Examination 5 months later showed no recurrence of either the ranula or the cervical cyst.

This type of case was not reported until a very able article by Thompson of Galveston, Texas, in the same month that this case was operated on by me. In it he attempts to discard the theories that a ranula comes from the sublingual gland, one of the mucous glands at the floor of the mouth, Wharton's duct, or the "adventitious bursa of Fleischmann." He attempts to prove that such an anatomical defect probably is derived from the so-called cervical or precervical sinus, which comes about through non obliteration of the second and third branchial clefts by the folding down of the second branchial arch. Under ordinary conditions, such a cyst would be low down in the neck, but due to a migration upward of the muscles of the tongue derived from the hypoglossal and palatal group, the cyst assumes a high position. Thompson has had experience with several cases. Two other cases are reported, one by Robert M. Lewis, and the other by P. G. Skillern, Jr. These are almost the exact analogues of mine. They, however, are of the opinion that the origin of the ranula and the cyst is in the sublingual gland. In a previous operation for ranula, Skillern's case had the submaxillary gland removed. Wherefore, he comes to his conclusion by a process of elimination.

The pathology is a moot point; Skillern gives no report of a microscopic examination. Lewis found that "the cyst wall showed a very thin outer coat of fibrous tissue lined with a simple layer of flattened epithelial cells." Thompson reports that "microscopic examination of the lining membrane of the cyst wall has been rather unsatisfactory. In most cases we were unable to find epithelium. When present it was of the tesselated variety. The fibrous tissue was fairly dense and the fibrous bundles were separated by large lymph spaces containing very few cellular elements."

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DEPARTMENT OF TECHNIQUE

CONTROL OF CHRONIC PAIN[1]

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CURRENT medical journals are full of accounts of operations designed to restore the lagging functions of youth and are read with avidity by both the medical profession and the laity. Possibly the reaction from the destructive processes of war has stimulated an effort upon the part of the writers to conserve life to the uttermost and to make procreation, even by the senile and by the abnormal, the great aim of the investigator.

While these attempts to stretch the span of life beyond the allotted three score years and ten and to restore the waning power of the sexual glands are worthy of admiration, there are some problems of a nature so practical and so pressing that there is some excuse for directing our energies away from the more alluring search for the fountain of youth. Among these is the urgent need of a method for the accurate and scientific control of chronic pain, especially that due to recurrent inoperable malignancy. The intractible pain of tic douloureux stimulated attempts to give relief to the sufferers by a method less hazardous than the surgical removal of the gasserian ganglion, which had an operative mortality of 50 per cent in the hands of the most experienced operators. To this end avulsion of the ends of the branches of the trifacial nerve, as far as possible beyond their foramina of exit, was practiced with temporary relief. This plan was succeeded by the injection of the nerve trunks by 2 per cent osmic acid. Relief was obtained by this plan for varying periods, but it had the disadvantage of being extremely irritating to the surrounding tissues and frequently caused necrosis when the injection was not accurately made into the nerve sheath.

Injections of alcohol of varying strength have proved satisfactory in a large number of cases of facial neuralgia and have produced analgesia for periods of 6 to 18 months. Thus the efforts to short circuit the painful area in facial neuralgia constitute the first accuracte, scientific, and safe method of combating chronic pain.

It seemed possible, therefore, to render other areas analgesic in which the paths of pain conduction were accessible to the injecting needle. If it is possible to perform almost any type of operation under local anæsthesia why should it not be just as feasible to render any given field painless for a greater length of time?

While the material at hand did not give an opportunity to test out a great many areas, the results achieved in the cases treated at least justifies a more extended application of the principle, i.e., local anæsthesia for the relief of chronic pain.

As the experimental and clinical data have not been sufficient to render an exhaustive report, this paper is presented rather as a preliminary study than as a complete work. The possibilities of mastering pain in hopeless conditions of malignancy was the incentive under which this work was undertaken. Every surgeon has seen cases of malignancy in which apparently none of the older methods gave relief. The woman with recurrent carcinoma of the breast, rocking constantly to and fro with the pain, is a not uncommon patient in any large hospital. The dread picture is familiar to us all, and yet so far no work has been undertaken for its relief. Many persons have no fear of death, yet who does not dread pain?

In many situations chronic pain may be controlled by interrupting the paths of pain conductions by the methods in vogue in local anæsthesia. The scientific accurate control of pain will do much to rob the course of hopeless malignancy of its horrors. The mental anguish may remain, but the somatic suffering in most cases can be spared to the patient. The relief of constant pain revives the drooping spirits of the sufferer and enables him often to put on weight and to gain in strength. The time-honored but inefficient attempts to produce an euthanasia by the administration of ever-increasing doses of opium or other narcotics must give place to a procedure which is efficient and which preserves the individual as himself to the end.

[1] Read before the Chicago Surgical Society, March 4, 1921. (For discussion see p. 206.)

The short circuiting of the painful area is accomplished by nerve-blocking in the form of neurectomy or of intraneural injection. In relatively small superficial malignant lesions the same end may be accomplished by the healing of the ulcer by radium. This is especially true of lesions about the orifices of the body. Nerve-block relieves the pain during the period of healing.

The agents used for intraneural injection are numerous and it is probable that no single drug is suitable to all cases. Chronic pain due to some condition other than malignancy is perhaps best treated by salt solution, novocaine, apothesin, or quinine and urea, because these produce but temporary loss of pain conduction. In painful states due to malignancy in which loss of motor function is of little moment, alcohol injections of the nerves or neurectomy is indicated. In cases of recurrent mammary carcinoma with great swelling and œdema of the upper extremity, the patient usually has to carry the involved arm, almost as a foreign body. Pain and swelling are so great that movement is practically impossible. Under such circumstances permanent block of the brachial plexus is indicated either by alcohol injection or by nerve resection. Nerve-block of the posterior sensory spinal nerve roots or intercostal nerves is frequently necessary as an adjunct to brachial plexus block because of metastasis in the tissues of the chest.

In thorax operations injection of intercostal nerves is best done at the lateral margin of the erector spinæ muscles near the angle of the ribs rather than close to the spinal column. On account of the many injections necessary when all the intercostal nerves are blocked it is better to mark out the points of attack first and these are later connected by a line of infiltration reaching from the first to the twelfth rib. The patient is in a sitting position with the spine flexed and the shoulder on the affected side carried forward. The nerve-block is now done by introducing the hollow needle just inside the infiltrated area about on a level with the spinous process of the first dorsal vertebra. The point is carried downward until the resistance caused by its contact with the first rib is felt. The under border of the rib is now sought and as soon as the point meets no more bony resistance the needle is forced in for the distance of one-half centimeter further and 5 cubic centimeters of solution injected. The same procedure is carried out in the second rib and so on until the desired area has been blocked off. After 15 minutes there is analgesia of the ribs, muscles, and pleura from the point of injection posteriorly as far forward as the sternum.

Kuhlenkamp's method of blocking the brachial plexus for the relief of acute and chronic pain in the upper extremity is as follows: The first rib is palpated just above the point where it passes beneath the clavicle. Slightly external to this the pulsation of the subclavian artery may be felt. The hollow needle is introduced just beyond this. If blood appears the needle is carefully withdrawn and introduced more laterally. It is carried downward until the resistance of the first rib is felt or until the patient feels the referred pain in the arm. The syringe is then attached and 5 to 10 cubic centimeters of one-half per cent solution apothesine or novocaine injected. Care should be observed not to use the needle as a lever because of the danger of tearing the subclavian vein. Analgesia appears in about 15 minutes.

It is not necessary with the use of novocaine or apothesin to inject the nerve sheath, although this is desirable because these agents are diffusible while with quinine and urea or alcohol it is necessary to inject the nerve sheath. It is therefore recommended that the plexus be exposed by incision under local anæsthesia when permanent analgesia is required for the relief of pain due to malignancy. With the plexus exposed either alcohol injection of the cords or section should be done.

ILLUSTRATION

CASE 1. An emaciated almost moribund French woman of about 60 years with a scirrhous carcinoma of the breast. The primary tumor was about the size of an orange and ulceration of the mass was advanced. There were metastases in the axillary and supraclavicular regions, but there had been no swelling of the arm. Pain had not been a marked symptom in this case because of the slow growth of the scirrhous tumor, but there was a continuous ache and discomfort.

A small cutaneous infiltration was made in the usual way just outside the point at which the calcareous subclavian artery was palpable. This spot lay in a deep fossa behind the clavicle which was elevated in the position of forced inspiration by the emphysematous character of the thorax. The needle was introduced at the point where the first rib passes beneath the clavicle. The patient exclaimed when the needle came in contact with the brachial plexus. Referred pain in the upper extremity is the sign that the needle has reached the desired spot. The syringe was then attached to the needle and 10 cubic centimeters of one-half per cent apothesine or novocaine solution introduced, at which time the needle was carried more deeply into the plexus. After the blocking of the brachial plexus the intercostal nerves of the same side from the second to the tenth rib were infiltrated at about the outer border of the erector spinæ muscles and the points of injection were connected with a perpendicular line of infiltration.

CASE 2. This woman was operated upon about 1 year previously and now has a recurrence in the scar and

axilla with brawny infiltration of the skin and elephantiasis of the arm, the tissues of which closely resembled the bark of a tree in color and consistency. This woman complained of great pain in the chest but comparatively little in the arm. Infiltration of the skin was done with great difficulty on account of the induration and the brachial plexus reached as evidenced by the patient's complaint of referred pain in the arm and hand. Ten centimeters of one-half per cent novocaine solution was injected into the plexus. This was the more difficult because the patient was unable to sit up. The intercostal nerves upon the same side from the first to the ninth were blocked in the usual manner.

Case 1 died within 24 hours following the nerve blocking. In this case, however, the fatal termination could not be charged to the novocaine injection as much larger doses have frequently been used without any systemic effect and it is a matter of general experience that 8 to 10 ounces are within the range of safe dosage when used over a large area and in tissues from which the rate of absorption must be slow. Case 2 was free from pain in about 15 minutes after the injection. She had complained of a sense of constriction about the chest before the nerve block but this distressing symptom disappeared, allowing of comfortable respiration. Forty-eight hours later there had been no return of the girdle pain.

Case 3. Sarcoma of the shaft of the humerus in a man of 40. There was enormous swelling of the arm, the soft tissues being tense and shiny. Ulceration had not occurred. The patient was brought into clinic in a wheel chair, rocking his body to and fro and moaning with pain. The brachial plexus was blocked by the method of Kuhlenkamp and within 10 minutes the patient was free from pain. The following day the radical operation with removal of the shoulder girdle and arm was done under general narcosis and the patient left the hospital as soon as his wound had healed so that further observation was impossible.

Case 4. Chronic intractible pain of the upper extremity following hemiplegia. This woman complained of inability to sleep and loss of weight and strength because of the constant pain. The brachial plexus was injected by the method described and the patient had a good rest the following night. Forty-eight hours later she reported that there had been no recurrence of the pain.

From the results obtained in the cases above described the belief is held that much of the suffering endured in the past may be avoided and the afflicted patient, though perhaps in an inoperable condition, may live out his days in peace.

With the pain gone, sleep becomes possible again, the general condition of the patient improves and death finally supervenes as the result of toxæmia rather than from exhaustion due to pain.

THE APPLICATION OF SILVER FOIL AS A PREVENTIVE OF PERITONEAL ADHESIONS[1]

By ARTHUR J. PULS, M.D., F.A.C.S., Milwaukee, Wisconsin

ETIOLOGY OF SEPTIC ADHESIONS

PERITONEAL adhesions owe their formation either to inflammatory abdominal and pelvic processes or are the sequel of a preceding surgical operation in spite of every aseptic precaution. Although the topic of frequent discussions at medical meetings, the surgeon is still at a loss to prevent this affliction to patients undergoing a primary or secondary cœliotomy.

Prophylaxis, i.e. strict asepsis, combined with rigid observance of the principles of surgery may prevent these complications, provided the patient, at the time of operation, does not suffer from bacteriæmia, in other words, is free from focal infection. The surgeon considers a diabetic or pyæmic patient a poor risk for immediate operation, but often overlooks one, who, apparently in good health, has hidden somewhere in the system a purulent gland or an infected sinus. It is obvious that he creates a *locus minoris resistentiæ* at the site of the operation field, even though he securely sutures the incised peritoneum. No matter how fine the needle, the puncture allows of secretion of minute driblets of blood and serum containing pyogenic germs and these cause a local inflammation, which produces web-like tissue formations between neighboring organs. How can we otherwise explain the repetition of the formation of adhesions after a thorough removal of the membranes? The introduction of a chemical irritant such as tincture of iodine and bichloride of mercury on the peritoneum, may cause abrasion of the epithelial cells and subsequent inflammation. We are supposed to practice asepsis but still resort to antiseptics in order to sterilize the patient's skin and the surgeon's hands, but contamination from those drugs of the abdominal organs must be avoided. Most of the peritoneal adhesions which the gynecologist is apt to deal with are caused by, first, sepsis of the uterine organs incidental to abortion or labor through direct external infection; next venereal infections, gonorrhœa, and lues, and then tuber-

[1] Read before the Chicago Gynecological Society, February 18, 1921. (For discussion see p. 224.)

culosis and carcinomatosis of the abdominal organs. Furthermore, ectopic gestation, acute and chronic appendicitis, cholecystitis, a perforating ulcer within the intestinal tract and finally a foreign body within the abdomen give rise to peritoneal adhesions.

Of the above mentioned infections which are known to be followed by various kinds of adhesions, the gonococcus is by far the most effective germ, and at the same time, the most destructive in undermining the physiological functions of the female sexual organs. As a curative procedure in gonorrhœal salpingitis, the fallopian tubes and ovaries, which are frequently enveloped in pus abscesses, and the comparatively innocent uterus, on account of its serous attachment to the diseased adnexa, need to be removed in their entirety in order to combat this infection. Conservative measures can only be undertaken after the disease has outrun its course.

ERA OF ANTISEPSIS 1880–1900

The early abdominal surgeons paid far more attention to the successful issue of the operation than to the formation of adhesions. These they even invited by the use of the rubber or glass drain. The question as to the disadvantages of drainage at wound closure was not raised until the beginning of the nineties. The concensus of opinion was unanimous, "when in doubt, *drain*." They became cognizant of the after-effects, and that adhesions between the bowels at times caused acute ileus, if not, at least a life-long intestinal distress, but the drain was considered a life-saver in many a case of abdominal operation. Lest we forget, abdominal tumors operated upon by these men were, without exception, of enormous size, adherent to the pelvic floor and abdominal wall, often degenerating into malignancy.

Although 95 per cent or even 100 per cent of his patients survive a capital operation without the use of a drain, the gynecologist of today wants his patients to remain free and be rid of all the discomforts from which they have suffered prior to surgical intervention; he does not intend to add a new affliction which may develop indefinite symptoms, but which a secondary operation reveals to be in the nature of peritoneal adhesions formed between the uterine appendages and a loop of the small intestine.

ETIOLOGY OF ASEPTIC ADHESIONS

From the foregoing, we have seen that adhesions of the peritoneal covering of the abdominal organs are chiefly the outcome of direct or indirect sepsis, and in contrast shall find that traumatism produces the aseptic type. In the direct septic type, germs have been introduced from without during an abdominal operation, a process, however, which we may exclude as long as strict asepsis is being practiced in a modern hospital. Hence, we shall consider only the indirect septic type, or auto-infection, as the primary cause to which the patient owes the existence of peritoneal adhesions, and later we shall review the aseptic type produced by surgical trauma.

During the acute stage of local peritonitis, adhesions to adjacent organs arise as a protective barrier. The membranes close and wall off an abscess cavity during pus formation, otherwise the patient would succumb to a general peritonitis. Rupture of such a defined acute abscess by whatever cause, calls for immediate surgical interference and drainage of the contaminated cavity.

A study of the anatomy of the lymphatic system, and more so, the knowledge of the relation of the pelvic connective tissue with each pelvic organ is essential, in order to explain the formation of pelvic exudates and of the adhesions which develop in the course of septic pelvic inflammatory disease.

But little has been added to the master work of Mascagni, whose atlas of the lymphatic system of the human body was the forerunner which led to the microscopic studies of the infectious diseases. (Chrobak and Rosthorn, page 175.)

The late work of Alfons von Rosthorn on the connective tissue of the pelvis has contributed much to our understanding of exudate formation and the course which pelvic exudates pursue in order to find an outlet for their pus contents. Following along prescribed routes, pus from a parametral abscess gravitates by way of the round ligaments into the inguinal canal; from the upper part of the broad ligament, it follows the psoas and iliac muscles down to Poupart's ligament. Exudates formed in the anterior pelvic cavity surround the bladder and extend along the anterior lower abdominal wall and travel toward the pelvic brim; those situated posteriorly, pass upward along the spinal column and surround the kidneys. After subsidence of the acute symptoms and during the period of resolution or evacuation of the pus by the surgeon, adhesions of various degrees of density and firmness are met with as the outcome of the preceding inflammatory processes.

Aseptic adhesions are mostly the result of surgical interference. In clean cases, such as in

operations for myomectomy, for malposition of the uterus, for initial appendicitis, or for cystic ovaries where the surgeon finds the entire peritoneal serosa intact and glistening, adhesions frequently do occur and form immediately after closure of the abdomen. What explanation can we offer for this phenomenon?

It is unusual, at the present day, to meet with wound infection, but it does happen to some of us, owing to various trifling causes or careless oversights, mainly due to haste, and such infection ends in the formation of hæmatomata, on account of the suture material being too quickly absorbed, or because of contamination of the wound with the hands of the patient, etc., etc. In vicious cases of wound infection, the infection affects first the fascia, next the muscles down to the peritoneum, so that the outcome, after weeks of suppuration, results in a postoperative hernia with internal adhesions of the peritoneal wall to the omentum or to the intestinal tract, leaving the person operated upon in a condition worse than he was before operation. Besides the surgeon will have on hand a very ungrateful patient. The wise man, in order to remedy the mischief, plicates the fascia, and thus cures the external injury, but leaves the internal membranes alone, lest he multiply their number.

DIAGNOSIS

It will always remain more or less a matter of conjecture to diagnose from symptoms complained of, even if a bimanual examination of the pelvis discloses malposition of the uterine organs, that the patient's ailment is due to the presence of peritoneal adhesions. Many times in cases of constant suffering from pelvic disease, adhesions are not found, and then again the existence of a mass of membranes between the various abdominal organs causes no pain whatever. The experienced diagnostician may conclude from the previous history of pelvic infection, that peritoneal adhesions will not be found wanting within the pelvic cavity. The severity of pain expressed by the patient is not always a criterion of the actual pathological condition. The gynecologist distinguishes between the hypersensitive and those patients who affect indifference to pain. During ovulation the ovary becomes highly sensitive so that a displacement of the right ovary by an adhesion to the intestine or to the appendix may simulate appendicitis.

As an aid to the diagnosis of intestinal adhesions, we may be able to judge from the fluoroscopic picture should a loop of an intestine be held firmly within the pelvic cavity.

PROPHYLACTIC TREATMENT

In pelvic as well as in general abdominal surgery, peritoneal adhesions can be prevented by observing the following surgical principles:

1. Never leave raw surfaces devoid of peritoneum, uncovered.

2. Do not allow leakage of the vessels and oozing from the amputated stump. We should bear in mind that the blood and lymph vessels frequently run parallel to each other so that leakage without producing inflammation supplies material sufficient to form membranous adhesions.

3. All abdominal sponges must be returned to the attendant nurse; should a piece of gauze or any other foreign body remain, it seeks for an outlet or becomes encysted.

4. Sponges should not be allowed to travel upward during a pelvic operation, nor allowed to pass downward among the intestines while operating on the gall-bladder or stomach. Experimental surgery on animals for the purpose of creating artificial adhesions, proves that the mere rubbing of the surface of the liver with dry gauze removes the capsule of Glisson and produces adhesions to the adjacent organs.[1]

5. Injury to a healthy organ by grasping the same with a volsellum forceps should be avoided. One ligature of fine silk, or chromicized catgut, ought to suffice to control the hæmorrhage of a spurting artery. The bunching of the broad ligament after the removal of the uterine adnexa, leaves denuded spaces. The Staffordshire knot of braided silk to ligate the stump, should never be used.

6. Rough manipulation of the intestines or their exposure for any length of time seems unwarranted. Prolonged operation under ether anæsthesia paralyzes the entire intestinal tract for days, causing retroperistalsis. Before normal peristalsis becomes established, agglutination and later firm adhesions may have occurred among the intestines.

7. Toilet of the abdominal cavity before closure, is a thing of the past and out of date. The injury caused by rubbing may prove disastrous; liquid blood retained, beneficial. Blood clots should be removed before closure. Should drainage be needed, the vaginal canal is the safest route to drain the pelvis.

8. Avoid contact of the intestinal serosa with tincture of iodine covering the abdomen, also contamination of the peritoneum with antiseptic solutions such as bichloride of mercury. Filling the abdominal cavity with salt solution, or sponging the abdominal organs with sterilized cam-

[1] F. C. Mann, Mayo Foundation.

phorated oil, grafting embryonal tissues or other membranes on denuded peritoneal wounds, have all proved failures in preventing adhesions.

In order to prevent subsequent adhesions of denuded peritoneal wounds produced by the removal of membranes, I have covered the defects with silver foil. In suppurating cases requiring drainage, I apply the foil over the stump and then insert a drain covered with silver foil.

During the last 6 months, I have had occasion to use the silver foil on eight patients.

On account of persistent vomiting, rupture of the abdominal wound in a young woman operated upon for salpingitis occurred in October, 1903. I found the small intestines completely covered with silver foil. The foil had been used as a primary dressing. The serosa of the intestines looked normal and not even congested, only at the mesenteric insertion there appeared spots of lymph exudate. A thorough scrubbing with salt solution in order to remove the silver, proved ineffectual, hence with considerable misgivings, I returned the whole mass into the abdomen. The patient, however, made a speedy recovery and never complained of intestinal trouble.

Of the eight patients operated upon, all recovered without wound infection, and were relieved by removing the cause.

Case 1. Mrs. K. age 50. August 23, hysteromyomectomy, spinal anæsthesia.

Case 2. Mrs. B., age 53. August 28, postoperative hernia, after hysteromyomectomy June 30, 1919. Ether anæsthesia.

Case 3. Mrs. S., age 30. September 28, pyosalpinx and ovarian abscess, ether anæsthesia. Bartholinitis May 1919.

Case 4. Miss J., age 27. October 19, retroflexion, ether anæsthesia.

Case 5. Mrs. V., age 26. November 4, retroversion, firm adhesion of right ovary to a loop of intestine. Appendectomy 1915, ether anæsthesia.

Case 6. Mrs. R., age 36. December 7, retroversion Relapse after suspension 1910. Ether anæsthesia.

Case 7. Mrs. R., age 34. December 28, retroversion,, ether anæsthesia.

Case 8. Mrs. F., age 42. December 30, cholecystectomy. Adhesion of gall-bladder to colon. Ether anæsthesia.

For retroversion of the uterus, I chose the Baldy Webster method. To the sutured, plicated, round ligament, I applied a small strip of silver foil. In the case where a firm band of adhesions had formed between the right ovary and a loop of the ileum, it was necessary to excise a portion of the ovary. After removal of the membrane, both organs were separately sutured, the wounds dried and then dressed with silver foil.

After removing the fibroid uterus (Case 1), I applied a leaf of silver foil over the cervical stump and posterior flap which had been denuded of its peritoneum, owing to an adhesion to the cul-de-sac.

In Case 2, I separated the omentum from the abdominal wall and applied silver foil to the denuded surface.

In Case 3, a most satisfactory result was obtained following operation for gonorrhœal salpingitis. Patient was first seen May 7, 1919, and was suffering from an acute swelling of the left Bartholin gland, Evacuation of pus brought relief. An examination later found the uterus and internal organs in normal condition and position. A year later, during September, 1920, while menstruating, she was seized with violent pains, accompanied by chills and fever. On examination of the pelvic organs on September 27th, the uterus was found retroverted and fixed to an indefinite mass on the left side; the right tube felt enlarged and the ovary tender to the touch. Cœliotomy was done September 28, 1920; both tubes were excised together with the left ovary and vermiiorm appendix, and both round ligaments were sutured posteriorly to the fundus uteri. Silver foil was applied to cover the stumps and over the sutured ligaments. The left ovary and tube had been found enveloped in a pus sac, adherent to the bladder, colon, and omentum. Examination 4 months later, January 22, 1921, showed the uterus in normal position, freely movable; the left pelvic and Douglas cavity, perfectly clear and free from pathological changes; the right ovary, slightly tender to the touch, in normal position. Menses were regular, every thirty days, somewhat painful.

Case 8. Base of gall-bladder could be easily detached from the adherent colon without wounding the serosa of the bowel. Excision of the organ was followed with considerable oozing from the liver, requiring a suture at its lower border. Before closing the peritoneum, a large drain, covered with silver foil, was placed in the bed of the excised gall-bladder. The drain was removed on the fifth day, the oozing having ceased. The wound closed of itself a week later when the patient left the hospital.

Mindful of my first experience (1903) of the harmless nature of silver foil, I did not hesitate, where I found the indication, to apply the same to the wounded abdominal serosa or peritoneum.

Bacteriology confirms the antiseptic properties of silver. We have learned to use the foil as a primary dressing on wounds from Halsted, of Baltimore, and prior to this, from Marion Sims, whose art in healing bladder fistulæ was without doubt due to the use of the silver wire suture. Later non-toxicity of silver was proved in the buried suture and its introduction in aneurisms.

From my own observation I feel warranted in proposing the application of silver foil to the amputated stumps of the infected fallopian tubes. It may possibly inhibit the vitality of latent germs embedded in the tissues of the severed adhesions, but it acts especially as a protection against subsequent adhesions of the denuded peritoneum which cannot be closed by suture.

NOTES ON THE HADRA-MARTIN-RAWLS OPERATION FOR CYSTOCELE[1]

By THEODORE J. DOEDERLEIN, M.D., Chicago

As the essential steps of the Hadra-Martin-Rawls operation for cystocele are, first free dissection, mobilization and elevation of the bladder, second, dissection of the pillars of the bladder and fascial structures underlying the vaginal mucosa back to the arcus tendineus, third imbrication of the pillars by transverse mattress-suturing, I deemed it not inappropriate to name those observers, to whom credit of priority in the perfection of this operation belongs, in their chronological order in the title of my article.

Hadra, of Texas, in 1887, first saw the necessity of thoroughly mobilizing and elevating the bladder in his operation for cystocele. Martin, in his book entitled *The Supporting Apparatus of the Female Genitals*, gives splendid illustrations of the uterofascial ligaments known as pillars of the bladder and, as a result of his research work, in 1911, developed his technique for the cure of bladder prolapse uniting the lateral fascial bundles. Rawls, in March, 1918, published his method of overlapping these bundles.

If we take into consideration the probability that the most frequent cause of cystocele is detachment of the bladder from the uterus and implantation lower down during and after childbirth, the logical cure of cystocele is detachment and elevation of the bladder and re-enforcement of its supports. The interposition operation, unnatural as it is, appeared to accomplish these ends in a most admirable way. It thoroughly detached and elevated the bladder and placed a solid support under it. Soon, however, complaints were heard as a consequence of this utter disarrangement of natural anatomical relations. We all had our unpleasant experiences with this method. Ares tabulates 37 cases of which 21 had unfavorable results. Of these 21, 50 per cent developed cystitis. There are certain cases in which this operation still has special indication but the number is limited.

Instead of placing the uterus under the bladder as a support, the method of strengthening the bladder pillars as perfected by Rawls is the anatomically correct one for correcting cystocele although not always feasible. It is, simply stated, the Bassini operation for hernia applied to the pelvic floor. Rawls' description as published in the *American Journal of Obstetrics and Diseases of Women and Children* is as follows:

"A small volsellum forceps is applied to the mucous membrane of the anterior vaginal wall about 1 centimeter above the cervix and another forceps about 1 centimeter below the external urethral orifice. Between these forceps a vertical incision is made through the mucosa and superficially into the underlying tissues. As soon as an edge on either side can be grasped with Allis forceps they are used as tractors and the incision is carefully carried forward until, in the mid-portion, the bladder can be demonstrated by blunt dissection.

"This blunt dissection is continued downward until the cervical attachment of the bladder pillars and the so-called uterovesical ligament are demonstrated. The latter is cut with scissors, keeping well in mid-line to avoid severing of the cervical attachments of the bladder pillars.

"The bladder is now separated by blunt dissection, using the gauze-covered finger, from the cervix upward to the peritoneal reflection and laterally well out to either side. By further blunt dissection the bladder is separated from the underlying pillars upward to the urethra and well out on either side. If there is a urethrocele, the dissection is carried up to the external urethral orifice. When the bladder is well mobilized, the bladder pillars are dissected from the underlying vaginal mucosa.

"In the mid-line the fascia and underlying mucosa are most often densely adherent and it is only with the greatest care that the true line of cleavage can be demonstrated. Too often at this point, by haste or the cutting of unidentified structures, the fascial sling is destroyed or buttonholed and we will fail to demonstrate a firm connective tissue. With the technique which I shall now describe I have always been able to demonstrate the bladder pillars even in elderly multipara with a long-standing prolapse.

"With a finger under the mucosa as a guide on which to cut down, the thinned-out fascial edge is dissected with a knife from the underlying mucosa. The mucosa flap is made paper thin and as soon as possible Allis forceps are applied as tractors to the fascial mucosal edges. This cutting dissection is continued from the mid-line, downward and upward, for a distance laterally until by blunt dissection a distinct line of cleavage is demonstrated the whole length of the primary incision. The mucosa is now easily separated, by

[1] Read before the Chicago Gynecological Society, January 21, 1921. (For discussion, see p. 195.)

blunt dissection, from the overlying pillars well out on either side to the arcus tendineus. Thus is demonstrated the strongest and thickest portion of the fascia which gives us two fixed points from which to estimate the amount of overlapping necessary to take up the slack in the fascial sling. The dissection is quite extensive but is comparatively free from bleeding unless by accident we injure the vaginal plexus of veins or the vaginal branch of the vesical artery which runs on the pubovesical ligament. The bladder and its lateral true ligaments are freely mobilized and the latter are overlapped from side to side by transverse mattress sutures of medium kangaroo tendon, at the level of the internal os one or two sutures entering the cervical tissue."

Having read Rawls' article in 1918 I was so impressed with the logical simplicity of his method that I at once applied it.

The first case, a woman 65 years old, of average weight, was suffering from prolapsus of the second degree, with eroded and hypertrophic cervix, a marked cystocele and the ordinary symptoms of cystic irritation. I carefully followed Rawls' technique, being surprised at the ease with which I could make the fascial separation. I amputated the cervix high up placing the first chromic catgut pillar suture directly above the line of amputation and carefully covering the cervical wound. Result perfect to this day.

In the succeeding 6 cases I was equally successful in finding the line of cleavage of the bladder pillars and dissecting the fascia back to the arcus. Of these cases I wish to refer to one only, a young mother of two children, who desired further offspring.

On this patient a Gilliam operation had been performed a year before in Milwaukee for the relief of cystocele and retroversion. The retroversion was cured but the cystocele remained unaffected. Her cystocele was of unusually large size and I expected very thin fascial structures and difficulty separating them. The operation went smoothly and the result to this day, 18 months, is perfect. This was one of the most grateful patients I ever had because she had been incapacitated by the almost gooseegg-like mass protruding and the cystic irritation.

In this case we had this marked cystocele without prolapse or cervical trouble, which goes to prove that cystocele of a most pronounced type may be present without prolapse, being due solely to a lowering of the bladder and weakening or separation of its pillars. I am somewhat anxious to learn what the result of labor will be as far as my newly constructed bladder pillars are concerned.

At first I approached this operation with some apprehension lest I would be unable to separate the fascia from the mucosa. As a matter of fact the fascia and mucosa are quite often firmly adherent in the mid-line, and it is difficult to find the line of cleavage. In a series of 6 cases, following Rawls' technique, I had good success in my dissection of the fascia and I commenced feeling secure. Then came a number of cases on which the operation was extremely difficult, the difficulty reaching a climax in a case operated upon only 6 weeks ago. After prolonged dissection I had nothing but useless fascial shreds and was utterly unable to approximate, much less overlap, whatever I had left of the fascia. Withal I had a very thin buttonholed mucosa. The best I could do was to sew the fascial border to the sides of the uterus and draw the broad ligaments over the cervix, thus doing an interposition operation with my distressingly thinned out mucosa covering the uterus. This patient already has complained of bladder-irritation, especially troublesome at night time.

One patient with a pronounced cystocele, some descensus uteri and cervical hypertrophy, an important case, I gave special attention as to vaginal asepsis. I always have been alive to the danger of infection and its disastrous consequences. The operation went smoothly. The arcus tendineus was reached easily and postoperative appearances seemed full of promise. Unfortunately this patient developed a most intense coli infection with high fever, great prostration and profuse suppuration. It took endless vaginal care lest my carefully placed mattress sutures and the whole work would be in vain. In this case my habit of occasionally placing a small cigarette drain into the subvesical space directly in front of the cervix, stood in good stead. Through this opening I saved my chromic catgut stitches and thus obtained a good result in spite of the pus.

It is a well known fact that cystocele, prolapsus, and even procidentia occur in nulliparous women. Kepler collected 151 cases and classifies them as follows:

1. Cases due to congenital defects which occur in the newborn or at the time of puberty.
2. Cases not due to congenital defects occurring later in life.

By far the greatest number of cases are met with in women with a history of severe labor especially with rapid instrumental deliveries. As early as 1903 Schatz pointed out, and has been referred to by Dr. Ries in 1918, that with the descending head, especially with rapid descent by the aid of forceps, the vagina is pulled down and is stripped off the bladder, which means that the anterior fornix of the vagina is almost obliterated and the bladder by a "sliding detachment" (Ries) is implanted lower down. This condition may reach so great an extent as to produce a direct relationship between the peritoneum and vaginal wall. Also Ward in 1919 calls attention to this type of obstetrical injury by

means of which the anterior fornix is obliterated. He states that the lengthening of the anterior vaginal wall, by actual measurement, is 5 centimeters, i.e., from the normal length of 6 centimeters to the lengthened condition of 11 centimeters creating what he calls the "weak spot."

In almost all my cases there was some degree of uterine descensus reaching in some instances a pronounced condition of prolapse. This descensus and prolapse were met with nothing else, besides, of course, the imbrication of the bladder pillars, than amputation of the hypertrophic cervix and levator suture, eliminating opening the abdomen. No doubt the shock incident to intraperitoneal work, no matter how little is done, is not present in external operations, and one reason why I became so enthusiastic for this fascial method was that it subjected the patient, especially the poorer operative risks, e. g. the aged, to less danger immediate and remote.

I admit the technical difficulties are much greater than in any of the other methods in vogue, that the possibility of infection is greater and not without danger to life. Louis Frank, of Louisville, reports a death from infection after an interposition operation, and I, as stated above, had my unpleasant experience. The advantages, however, are so manifold that wider adoption should be advocated.

We will, of course, meet cases where the fascial structures are thinned out to such an extent that the bladder pillars are practically useless for our purpose, where the accompanying prolapse is so severe or the intra-abdominal pathological conditions present are of a nature that other operative measures must be employed. If we remember, however, that this operation is applicable to cystocele both in parous women as well as in those past the climacteric we appreciate its value and wide range of applicability.

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TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD JANUARY 21, 1921, DR. ARTHUR H. CURTIS, PRESIDING

PAROVARIAN CYST

DR. WILLIAM M. THOMPSON: I would like to show a specimen of parovarian cyst which measured 7 inches in length and 4 inches in width when it was removed. The cyst was kidney-shaped, was situated below the fundus, and encircled the cervix. Undoubtedly it would have had a long pedicle if it had been allowed to remain, as pedicles increase in length very rapidly. You can see the fimbriæ at the end by turning the specimen around. The patient was a little over 2 months pregnant and complained of pressure and weight in the pelvis. She knew she had the cyst because she had been told about it before she became pregnant. The cyst was easily removed without disturbing the pregnancy, and as the appendix was found to be diseased it was also removed.

This case brings up the question: What are the results of such an operation on pregnancy and is pregnancy often disturbed? The only statistics available have to do with pregnancy complicated by ovarian cysts. At the second month or thereabouts in 20 per cent of cases, pregnancy is disturbed; at the fourth month a much less number; at the sixth month the greatest number. This is particularly true when ovarian tumors are extirpated, for the reason that the corpus luteum of pregnancy is removed and thus the stabilizing influence upon the uterus is lost. From the result in this case it would seem that a parovarian cyst ought not to cause much disturbance in pregnancy if the operation for the removal of the cyst is done with due care and the uterus is not handled. There can be no question that when such cysts are discovered during pregnancy they should be removed.

DR. CURTIS: I would like to ask whether there was a corpus luteum in the opposite.

DR. THOMPSON: As this was a parovarian cyst the ovary was not disturbed.

PRIMARY CARCINOMA OF THE CLITORIS

DR. CAREY CULBERTSON: I have sections under the microscope of primary carcinoma of the clitoris. The tumor from which the sections were made was removed from a women 50 years of age who entered the hospital complaining of pain in the left inguinal region and dysuria. The pain had been present for 2 months and the urinary distress for 3 months. For 5 weeks she had noticed a soreness in the neighborhood of the vestibule. There had been no bloody discharge and no loss of weight. Menopause had occurred 7 years previously.

The abdomen was very fat, soft, and pendulous and no inguinal glands could be palpated. The vagina was narrow, short, and constricted; the cervix and corpus uteri, atrophic and free; the appendages were not palpable. A rough, papillary, indurated area 1.5 centimeters in diameter covered the lower one-half of the clitoris and extended to the left over the upper portion of the left labium majorum.

The growth was removed by wide dissection including the entire clitoris and the left labia. Exploration of the inguinal canals revealed but one enlarged gland from the left side, microscopic section of which showed round cell infiltration only. Sections of the tumor showed an early alveolar carcinoma.

GASTROSCHISIS

DR. HENRY F. LEWIS: The first specimen I have to show is a fœtus born in the Cook County Hospital a few days ago. The history is negative, except this: The mother thought she was about 6 months pregnant; she had gonorrhœa and had been treating herself with douches right along before and during pregnancy. She was passing a douche point on the day of entrance, when she bled a great deal and came to the hospital on account of that bleeding. The resident found she was in labor and thought he had a placenta prævia to deal with. He examined her rectally at the time. The bleeding stopped, so he allowed her to deliver herself and this fœtus came down. The membranes ruptured with escape of the scanty amniotic fluid. After vaginal examination, he diagnosed an anomaly.

The membranes are pretty well shrunken by the formalin. The fœtus delivered through the vulva with the intestines, kidneys, lungs, liver, in short, all of the organs of the chest, abdomen, and pelvis presenting. There is no sign, macroscopically, of any external genitalia. There is marked retroflexion of the lumbar spinal column, so much that the buttocks and legs lie posteriorly and parallel to the body, although there is no spina bifida. This retroflexion may have been the immediate reason for failure of closure of the abdominal cleft, which is open as far up as the umbilicus. The cord runs along here, on the membranes, to the placenta which, of course, was a placenta prævia marginalis.

The case is one of extreme gastroschisis, the abdomen and thorax being empty. Both feet are clubbed.

In this connection I report the case of a small fœtus, a little older than the one shown. It was born breech first. The child has a complete opening of the pelvis, a splitting through the pubes. The right thigh extends beyond the knee and the leg is attached 2 centimeters proximal to the distal end of the thigh. Both feet are clubbed. The baby was born outside and was such a horrible looking thing that they sent it over to the County Hospital right away. It is still living, at the sixth day.

There is a defect of the skin on the abdominal wall, running from above the umbilicus and enclosing an area as large as a half-dollar around it. This portion is covered by a membrane resembling cord tissue and, with the stump of the cord, is necrotic. The complete opening in the anterior aspect of the body extends over the whole pubic and part of the suprapubic region. There is complete exstrophy of the bladder with splitting of the penis into two parts. These parts lie at the lateral margins of the defect and 2 centimeters apart. The perineum is split to the coccyx. The portion of the bladder that is left bulges forward in two connecting circles each as large as a dime. The urine trickles over these areas from the ureteral openings. Meconium and fæces come through a rectum which bulges from just below the bladder in the median line.

There is necrosis of the cord, which has been tied, and this necrosis extends over a thin membranous area which replaces the abdominal wall in the region of the umbilicus. This, of course, is septic and a peritonitis will probably soon develop. Over the lower back is a flaccid, skin-covered sac about as large as half of a golf ball, probably a spina bifida.

Except for these anomalies, the child, of about 36 weeks' gestation, is healthy, seems in no pain, eats, sleeps, and cries normally.

CRANIORRHACHISCHISIS

Here is another specimen, which I have not seen before, but the internes have told me about it. It was born in the Cook County Hospital last night.

It has a flat head but it has a brain. The cranial bones are small but apparently intact except for the occiput. It is not a case of anencephalus but of craniorrhachischisis, of the variety known as notencephalus. You see the brain and meninges in this thin membranous sac lying behind the cranium and bulging over the dorsum of the fœtus. The brain and meninges have escaped through a defect mostly in the occiput and a small defect in the cervical and upper two dorsal vertebræ. The size of the brain is about one-third of what would be normal for a fœtus of its age, about 34 weeks.

Illustrating retroflexion of the spine which occurs in most cases of craniorrhachischisis, here is a case which occurred on my service in the County Hospital 6 months ago, of iniencephalus.

The whole head is intact but there is a defect in the occiput and in the cervical and upper two-thirds of the dorsal vertebræ. The brain is contained in the cranium and is covered by the cranial bones, but it rests upon the widely and flatly separated vertebræ, the outer margins of which are joined to the margins of the occipital defect. Thus the brain is almost completely enclosed by bone. The cranial floor and the cervical and dorsal spine are shortened longitudinally, causing a retroflexion of the dorsum of the fœtus. The anus is away up here as I show you, 1.5 centimeters behind the spinal defect. The fœtus has a protuberant abdomen, but the retroflexion was not sufficient to prevent closure of the abdominal cleft, so that it was possible for the abdominal contents to remain enclosed. There is a slight spina bifida extending below the occiput down to about the ninth dorsal vertebra.

Of course, retroflexion of the dorsum is not the only reason for failure of closure of the abdominal cleft. The two cases already exhibited of gastroschisis were obviously caused by something else. The subject of causation of monstrosities is too vast to be undertaken now.

PESSARY REMOVED FROM VAGINA

This pessary was removed from the vagina of a woman, 60 years of age, after it had been there for 3 years. She had procidentia for many years for which, 3 years ago, a doctor in Indiana introduced this large hard rubber pessary.

The pessary is about 3 inches square with rounded corners and a round hole in the center, about 2½ inches in diameter. The posterior portion is about 1½ inches thick and the anterior two-thirds is about ¾ inch thick.

The patient was instructed to take douches for cleanliness. She tried to comply but the pessary came down and presented one corner at the vulva so that she could not get a douche point beyond it, so the douches did little good. She was nevertheless instructed to leave the instrument in and there it remained for 3 years until the discharge became so foul that she wanted the pessary removed.

I made an effort to remove it at the office, but found that I could not do so. The woman was then sent to the University Hospital, where, under an anæsthetic, I tried to saw it into two pieces with a Gigli saw, but that did not work. In the attempt I broke the saw. Then I cut the pessary up into pieces with bone forceps and removed it in that manner.

DR. THOMPSON: What was the condition of the vagina?

DR. LEWIS: Very good: there were only a few small ulcerated places in the mucosa and these soon healed. A recent examination reveals a small normal uterus in a condition of senile atrophy, the uterus and bladder well up and apparently fairly well supported by the contracted vaginal walls.

SIMULATED UNILOCULAR TWIN ECTOPIC PREGNANCY

This last specimen which I show you is one of interest to me. I obtained it at a recent operation for diagnosed unruptured tubal pregnancy, performed at the University Hospital. On bringing the left tube into view, I thought I had a twin pregnancy therein. Since it has been hardened and cut through longitudinally, I now believe I was mistaken. Dr. Nachtigall will section it for microscopical examination and the doubt will be removed. The specimen has shrunken considerably in the formalin.

The specimen consists of the left fallopian tube of a women of 33 years, pregnant for the first time, and, as she thinks, at about 4 weeks. You see that the tube has two bulbous enlargements, one at the ampulla and the other shortly proximal thereto in the isthmus. Both were, at the first view during the operation, of equal size. A little blood came out of the ampullar bulb when I ruptured it in removal and some of the collapsed chorion shortly followed. The picture shows the tube with its two bulbs, the ampullar bulb ruptured and with membranes protruding.

I thought at first that the isthmic bulb contained the second ectopic twin. However, when I split it after hardening in formalin for a week, it seemed to contain only a clot which readily separated from the cavity of the tube and did not seem adherent to the wall. There was a minute hole running between the bulbs, which was apparently filling up the proximal bulb with blood from the distal bulb during an aborted ectopic pregnancy in the latter. The blood may have escaped into the proximal part of the tube instead of through the fimbriated extremity.

DR. ARTHUR H. CURTIS: The pessary case reported by Dr. Lewis reminds me of a patient whom I saw in Vienna 15 years ago. This woman had worn a pessary for 20 years. It had become embedded in the vagina in a position which a pessary ordinarily occupies, and an epithelioma had developed and grown so large that it completely covered the pessary throughout its entire extent.

HADRA-MARTIN-RAWLS OPERATION FOR CYSTOCELE

DR. THEODORE J. DOEDERLEIN read a paper entitled "Notes on the Hadra-Martin-Rawls Operation for Cystocele." (See p. 190.)

DISCUSSION

DR. EMIL RIES: As you may know, I have devised an operation for prolapse of the uterus which is quite different from the Hadra-Martin-Rawls procedure, and much more extensive. The experience I have had with other operations before I devised my own, and the study of the pathological anatomy of prolapse, have led me to think that the operation described this evening is entirely insufficient. In many cases it is absolutely impossible to do it because there is not enough material to do what is claimed can be done.

In the operation which I do there is extensive dissection of the bladder away from the uterus, and in that dissection I must needs encounter the material with which Dr. Rawls is doing his operation. I have often demonstrated these fascial or connective-tissue bundles of which he speaks, and I have demonstrated how thin and frail they are. However, sometimes they are quite well developed. The fundamental mistake of that operation is that it does not open the abdomen. Instead of its being an advantage not to open it, it is a decided disadvantage. If you want to do a thorough dissection of the bladder, you cannot do it without opening the peritoneum. The bladder in some cases has sunk away from the wall of the uterus to such an extent that the vesico-uterine pouch is in direct contact with the vaginal wall, while ordinarily it is not. If you look at the Halban and Tandler atlas of prolapse of the uterus you will find pictures taken from actual specimens from the dead house, demonstrating contact of the peritoneum with the vaginal wall. If you have a case like that, or even a case not quite as bad as that, and you make a bridge of connective tissue under that part of the bladder which forms the cystocele you do not hold the bladder in position; it does not bring the bladder back where it should be; it raises it up, and when the bands of connective tissue have been stretched by the filling and emptying of the bladder for some time, you have the same condition again as before.

In addition, I want to say in these cases of prolapse with a large cystocele, a little vaginal operation will not make a bit of difference. It will not hold up the uterus. You have to do other things with it. The vast majority of cases we encounter are cases of prolapse with cystocele. I am willing to agree that the older operations that were done in connection with prolapse and which were intended to take care of a part of the cystocele were poor operations. That is why I found myself obliged to devise something better. The older operations which excised a piece of vagina and sutured the edges together, inverted the prolapsed bladder wall or fastened it up on the uterus by buried sutures—I believe are defective. If you look back over the cases you operated on 10 or 15 years ago, the first thing you will find that occurs again is the cystocele. It is the hardest part to cure. In the operation some of you had occasion to see me perform at the Michael Reese Hospital in a case of prolapse of the uterus you will recall what an extensive dissection we did over the bladder, and how much care we spent on the bladder in the operation, not only from below in forming a new vaginal fornix, dissecting up the bladder from its faulty position, but in fastening it high above the uterus where it belonged, and in cases of considerable prolapse where the bladder had become separated from the symphysis, attaching the anterior bladder

wall to the posterior surface of the anterior abdominal wall. I do not know whether that description is clear to you or not. I suppose in mild cases of cystocele, where there is no prolapse, and where there is a well developed bundle of connective tissue to work with, this operation may be of some use.

Dr. Joseph B. De Lee: I want to agree with Dr. Ries about his operation for extensive prolapse. There has got to be much more done for a complete prolapse of long standing where the bladder wall is thinned out and the fascia is web-like, than this plastic operation does. A large number of women does not have a complete prolapse, but a partial prolapse, with an annoying cystocele and urethrocele which require relief. This operation in the few times I have done it has really been very successful. It is possible to dissect out this fascia, not as perfectly as I can do it with plasticin, but approximately, and in a satisfactory manner. The other day I had to vary the technique a little. This part (indicating) of the fascia was thin, and I button-holed it in several parts at the side, and I could not get a good layer, but down here to the left behind I found a good thick layer of fascia, as thick as this point (indicating) which I brought over and attached on each side in the manner of an autoplastic graft. I attached it to each side but high enough where I could get fascial structures and reconstructed a very firm base of the bladder. There is a large number of cases where this operation is indicated and it can be carried out successfully. We can hold the uterus in anteversion by attaching the fascia to it above the internal os. You see a blue button on the uterus there (indicating). Now after these two layers of fascia have been imbricated a stitch is placed through the middle of the fascial span and the bridge is anchored away up above the internal os. You push up the peritoneum and by means of volsella, pulling down the uterus without opening the peritoneal cavity, this fascia can be anchored high up. The fascia upon the uterine wall pulls the fundus forward and the cervix goes backward.

I have prepared a little model (exhibiting model) for the demonstration of the levator ani. This is a woman's pelvis made with the ligaments put in to show the fascial structures and muscle. In this connection I may revert to a discussion which Dr. Barrett and I had recently. Dr. Ries has made a very important point regarding nomenclature and I think it would be a good idea for this society to appoint a committee to establish names for these structures. Most of our discussions run afield and we get all mixed up, because we do not call things by the same name. For that reason I brought this pelvis with these muscles put in plasticin. I spent half an hour this afternoon with Professor Ranson, of Northwestern University, and these models correspond to the anatomical structures indicated and were confirmed upon the cadaver. The differences of opinion have been simply matters of names. We ought to have these various muscles named, and have the Gynecological Society accept them.

What we have tried to bring together, as you see, is the fascia (indicating). These yellow structures indicate the pillars. There is a white line to which we try to attach the fascia after it is imbricated from below, but we do not always reach the white line. If you are skillful with the needle, you can put the stitch in under the guidance of touch. This layer (indicating) goes between the rectum and vagina, and that layer (indicating) goes between the bladder and vagina. The uterus would lie there (indicating), and when labor comes on it forces the fascia down and tears it off of the uterus. It bends it out and stretches it from side to side. The operation consists in denuding from below so that you can take hold of the fascia and imbricate it and sew it as close as you can to the thickened areas of fascia over the white line.

Dr. Albert Goldspohn: I must say that the vesical columns are not actually as large as they are represented in this manikin; and the experience of the gentlemen who have so far discussed it, confirms that opinion. These structures are too delicate to be detached from the vaginal wall and used separately, as a rule. Such dissection merely weakens them. They are better used in connection with the vagina, reinforcing it. After the median wound edges of the bilateral vaginal flaps have been trimmed sufficiently, these flaps should be imbricated by sliding one completely over the other one, after the outer mucous membrane of the buried side has been sufficiently denuded to obtain a union. With chromic catgut excellent results are obtained in this way. In cases of vesicocele with moderate uterine prolapse, I detach the bladder from the uterus and broad ligaments completely and open up the anterior peritoneal cul-de-sac widely. I then implant the bladder upon the top of the fundus uteri, by carefully stitching the raw edge of the bladder peritoneum to the upper posterior border of the fundus clear across from the upper border of the broad ligament of one side to that of the other. The entire anterior surface of the uterus is then free and available for an extensive and firm fibrofibrous union with the imbricated and massive flaps of anterior vaginal wall. This union broadly made and secured with chromic gut will prevent the bladder from creeping down again, and it will also take care of a moderate uterine descensus, provided the pelvic floor is effectively restored so as to secure a stable foundation beneath. In cases of elongated cervix an amputation should be made.

In cases of vesicocele accompanied by great uterine prolapse, I do not open the anterior peritoneal cul-de-sac. After having carefully detached the anterior vaginal wall from the bulging bladder sideways from a median incision, and after detaching only the lower part of the bladder from the cervix, I reduce the expanded bladder somewhat in the median line by reefing its denuded surface with fine chromic catgut, and then limit its downward descent by a higher attachment of the imbricated vaginal flaps upon the upper part of the denuded cervix, so

as to oblige the bladder in future to expand laterally rather than downward, by the low vaginal fixation and by the doubled and shortened vaginal wall in front of it. Next in order and importance is a thorough restoration of the pelvic floor to secure a durable foundation beneath; and I then make a small ventral incision into which the fundus of the uterus with the round ligaments is drawn and durably anchored in the abdominal recti muscles and fasciæ, after all adhesions and hindering retractions about the descended uterus have been overcome. My results with these methods have been so satisfactory that I would never perform the abnormal Shauta, Wertheim, Watkins (interposition) operation upon any woman, ever so old. As long as she is living she may develop an endometritis; and then nothing but a difficult and mutilating hysterectomy would be possible.

DR. MARK GOLDSTINE: I wish Dr. Watkins was here to take up and defend the interposition operation. I have seen him do the interposition operation, and have followed a number of his cases for 8 or 9 years, and for 10 years I have been doing the interposition operation myself.

I do not want to enter into any controversy about the relative merits of the different operations. Dr. Ries has stated why he does not think the Rawls operation is sufficient. Personally, I cannot see where one would put the bladder in most of these cases, where you do the Rawls operation, between the peritoneum and the vaginal wall or the fascia.

In regard to deaths following the operation, I will say that if you do enough gynecology you will get a death now and then from any operation. I have seen deaths from simple curettement, and one from perineorrhaphy, and one or two deaths from the interposition operation.

As regards the interposition operation, to those of you who have not followed the writings on this subject, as outlined by Dr. Watkins, I will say that the interposition operation does not always mean the interposing of the whole uterus between the vaginal wall and the bladder. Oftentimes a part of the fundus is removed. A great many times the cervix is amputated, and sometimes the whole fundus is removed very nearly to the cervix, leaving a small stump. You take out practically all the uterus and interpose a small part of it along with broad ligaments, and the broad ligaments themselves underneath the bladder. I am firmly convinced that there are certain cases of prolapse of the uterus with cystocele that you can repair only by following the lines of the interposition operation. I am likewise firmly convinced that there are certain cases of prolapse of the uterus that the Ries operation, the Rawls operation, or any other operation for cystocele will not cure; you have to operate vaginally, you must follow some line of the interposition operation or you will not cure them, particularly those cases in old women in which the uterus protrudes from 4 to 6 inches, in which the bladder comes down on the uterus 4 or 5 inches. In these cases the uterus is extremely prolapsed and the only way these cases can be cured is through some form of interposition operation. Attaching the uterus to the abdominal wall fails in that the cystocele returns, and for some reason the cervix elongates. Why the cervix elongates I do not know. It is as much a total failure as we have occasionally in the interposition operation. Some of you gentlemen have apparently seen failures from the interposition operation. I have had probably four or five failures from the immense number of these operations I have done. In those cases you will not find the bladder coming down. You will find the vaginal wall is relaxed, the fascia is relaxed as it is in the Rawls or any other operation, and the uterus is protruding, and not the bladder. If the vaginal wall is dissected off you will find it underneath the fundus of the uterus. You will find the bladder up in the peritoneal cavity where you put it. The only way to cure such a case is to remove the superabundant uterine tissue. All these operations carry with them the repair of the posterior vaginal wall.

I rise simply to defend the interposition operation. I have seen the other operations done and am familiar with the results. I have followed the interposition operation in a great many cases for years, and after studying and using other methods I do not hesitate to say that I prefer the interposition operation. Dr. Heaney and I discussed those cases where the uterus and cervix come down at the vulva, and with the interposition operation you can leave practically the whole uterus where the fundus is not too large. Where there is prolapse of a greater degree you will have to modify the operation.

As I have said before, I rise to defend the interposition operation and to say that most of the things said against it are not true.

DR. CHANNING W. BARRETT: After listening to the remarks of the last speaker (Dr. Goldstine), if one believes all he has said, it is time for some one to present the other side of the question. He rose to defend the interposition operation, but defended it to such an extent as to say that no other procedure could cure some of the worst cases of prolapse of the uterus. I think we have some of the worst cases of prolapse of the uterus, that come to the County Hospital, that exist in Chicago. If we have not, I do not know where you get them. I maintain that we can cure prolapse and cystocele without the interposition operation. I don't say you cannot cure cystocele with the interposition operation, but it can be cured just as well without that operation. I would prefer to have the uterus above the bladder where it belongs, than to have it under the bladder where it does not belong, if either operation will cure the cystocele.

Going back to what has been said tonight, it would seem the vaginal operation does not do the work that is needed to be done, and there were those who have said we must follow a more anatomical and rational procedure, something that is more effectual

than vaginal plastic work; and there were those who have said these procedures do not cure, and so they were willing to operate on cases that were more pathological. We are willing to plant the uterus into the abdominal wall or plant it under the bladder to cure a cystocele. I have seen a great deal more harm come from the interposition operation than from any cystocele operation that has been done. Certain things are necessary to cure prolapse of the uterus. We must have a good pelvic floor, and that can always be made. We must do away with the redundancy of tissue anteriorly, so that it will not roll over the pelvic floor, and in doing away with that redundancy these pillars can be dealt with. I would not consider them as very essential in the operation for prolapse of the uterus. That is merely one step in the procedure. We must have the uterus out of line with the vagina, or, if it is an old woman of 60 or 70 years of age, and the uterus comes outside, the uterus can be taken out, and the broad ligaments planted into the vagina to hold the vagina upward and back. With the vagina held upward and back, you get an oblique line instead of a vertical one, and the redundancy can be done away with. These structures are not always present to any very useful degree, but with a large mobilization of the bladder you can get it back out of the way of the mucosa of the bladder.

I would like to say a few words about this manikin exhibited by Dr. De Lee, which does not correspond to the one he showed at the North Side Branch of the Chicago Medical Society the other evening. It was not a question of nomenclature but of facts as to anatomy. The specimen shown up there did not even touch the spine of the ischium. It was fastened to something away above that. The question was whether the white line ran to the spine of the ischium or not. He held it did not, and I held it did. The levator ani muscle rises from the posterior surface of the pubic bone from the white line and spine of the ischium. Dr. De Lee said he would make a public announcement if he was wrong.

Dr. William C. Danforth: Regarding the controversy over the interposition operation, I have used this operation to a limited degree for the cure of extreme cystocele where there was not much prolapse of the uterus. I have followed the papers of Drs. Rawls and Ward closely because the operation seems to provide a possible way to cure cystocele with which we have so much trouble.

After seeing the beautiful model and an operation by Dr. De Lee at the Chicago Lying-In Hospital, I used his method in a case which I thought fitted in beautifully. I attempted a careful, painstaking dissection to separate these layers, and it was done with great difficulty. This case was one of those in which the dissection was difficult. A number of speakers referred to having found occasionally cases where this separation could not be made. In my case we could not get anything that would give us any anatomical support, and were compelled to go back to the usual method which I have used before. I expect to try it again, but it seems to me, these technical difficulties are going to be the ones which will defeat the results.

Dr. N. Sproat Heaney: Dr. Danforth and Dr. Ries have summed up the principal objection to the operation under discussion. The more necessary the operation is, the less tissue we have to work with; the more necessary the operation, the more attenuated are the structures, so that sometimes we have instances where we can hardly find anything that will resemble pillars of the bladder. In smaller cystoceles this operation is sometimes satisfactory. In the big cases I prefer the Watkins-Wertheim operation. I will say that Dr. Ries' operation as I have seen him perform it, I am quite certain is a cure for these very bad cases of cystocele. I personally have not yet adopted it because I have thus far been well satisfied with the interposition operation. One objection against this operation has been made tonight — that, in the event that a hysterectomy becomes necessary, it would be almost impossible or at least a very serious procedure. Now I have done hysterectomy in two cases following an interposition. The operation in both instances proceeded without any particular difficulty—probably not as easily as the easiest hysterectomy imaginable, yet caused no particular difficulty or concern.

Dr. Doederlein (closing): The primary object of my paper was to bring this subject up for consideration, and I am glad to have heard so free a discussion for my own information because, as I stated in the paper, I was not entirely satisfied with this operation. In the first series of cases in which I tried it the operation worked smoothly, then I struck a few obstacles.

There is one thing I want to mention and that is in regard to the interposition operation being a cure for cystocele. It was not my intention at all to eliminate this operation because it does not support. It is the effects of the interposition operation on the bladder we are afraid of. In my cases I had cystic irritation and have had some unpleasant cases that keep harassing me. If we bear in mind that the Rawls operation is indicated in cystocele, and not in prolapse of the uterus so much, which was illustrated by the case of this young mother where there was no prolapse but a pronounced cystocele to the extent of a goose egg, and who desired further offspring, then it has a distinct indication, and in a case like this, where a young mother desires further offspring, I would be in a quandary as to which operation I should do if I did not know of the Rawls operation. Where there is a cystocele only I would not know what to do except this "Bassini operation" on the pelvic floor.

As regards separating the structures, referred to by Dr. Goldspohn, with due respect to Dr. Goldspohn's seniority and vast experience I would say that if we wish to have a firm hold as in large umbilical herniæ, we have to dissect the structures into anatomical layers and then imbricate them. This, in my opinion, also holds good in pelvic floor surgery.

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD FEBRUARY 18, 1921, DR. ARTHUR H. CURTIS, PRESIDING

MALIGNANT POLYPI OF THE UTERUS

DR. N. SPROAT HEANEY: The patient from whom I secured this specimen was a woman, aged 39, who had been married for 18 years and who had never been pregnant. She came to the hospital with the history of having for the past few months been menstruating more frequently than usual and more profusely. The bleeding was associated with considerable pain and cramps at the menstrual period.

Upon examination it was found that patient had a large fibroid of the uterus. Because of her age and the findings it seemed probable that we would have to do a hysterectomy, so no vaginal work was done. Upon opening the abdomen we found a pedunculated fibroid about the size of a fœtal head. The uterus was otherwise normal, except retroverted. We removed the fibroid and left the uterus in but shortened the ligaments.

Since the fibroid would not explain the bleeding I put her in the lithotomy position and removed an apparently simple polypus. It was thought to be benign, but microscopical examination showed malignancy, although the endometrium removed from the uterus was benign. I showed the specimen to Dr. Ries, who concurred in the diagnosis. I then reopened the abdomen and removed the uterus. There was a perfectly smooth endometrium with no sign of attachment of the polyp and no evidence of malignancy of the polyp.

I had a similar case 8 or 9 years ago in which the woman complained of bleeding and there was no displacement of the uterus. I removed the polypi and curetted the uterus. The polypi were malignant but the scrapings were benign, showing no involvement of the endometrium itself.

ROENTGENOGRAM OF FŒTUS IN UTERO

Dr. Hewitt has brought along a roentgenogram of a patient showing the fœtus *in utero* just before a cæsarean section. The film was taken to determine the size of the head. It was thought to be very large and we wanted to be certain about the size of its head in relation to the pelvic inlet. There was some hydramnios and it was impossible to make out the size of the head by palpation. The films showed that the bones were very dense and the head quite large. The patient had previously had four pregnancies, the first an instrumental delivery, the second, third, and fourth all instrumental and unsuccessful deliveries, the infants dying at birth. The patient estimated that her pregnancy would terminate February 8, and that she would be at term at that time, but she entered the hospital with evidences of toxæmia. The abdomen was enormously distended, the uterus was apparently quite full, and a very large child could be palpated as well as some hydramnios. Because of her previous history and the large baby, cæsarean section was taken into consideration and the picture showed conclusively that the child was very large and the head rather out of proportion. The baby weighed 10½ pounds. I show this roentgenogram chiefly because of the beauty of the X-ray film.

ABDOMINAL PREGNANCY FOLLOWING HYSTERECTOMY

DR. W. A. MCMILLAN and DR. R. H. DUNN, Charleston, West Virginia, presented the "Report of a Case of Abdominal Pregnancy Following Hysterectomy."

The patient's parents are living and healthy. She has one sister and one brother, and both are well. Patient had ordinary diseases of childhood. She began to menstruate at the age of 13; always regular; enjoying good health; made good grades in school and at about 15 years of age started earning her own living as a piano player in one of the moving picture show houses.

On December 14 I was called to see her. I diagnosed the pain in her lower pelvis as acute double pyosalpynx and advised the application of ice, rest in bed, douches, etc., and operation later.

The patient was admitted to the McMillan Hospital January 22, 1918. On opening the abdomen in the median line we found both tubes very adherent to the surrounding structure and, after removal of the adhesions, the body of the uterus presented such an angry appearance that I determined upon a clean removal of the tubes, uterus, and diseased ovaries. As the right ovary and a section of right tube were healthy in part we stitched them up to the fold of mucous membrane which we brought over to make a smooth surface for the stump of the cervix.

The hospital records say the patient made a good recovery and left the hospital February 16, 1918. The patient seldom came under my notice after the operation and soon returned to her work as a pianist.

On July 4, 1919, the mother of the girl called me saying that she was worried about her daughter. On examination at my office I was at once impressed with a tumor in the abdomen. The girl looked well and felt well, with the exception of "cramping and the kicking in the abdomen." Upon palpation I easily made out the tumor over the left side of the abdomen, and also what I thought to be the fœtal heart beat. She told me of having sexual relations, and was very indignant toward me for

telling her when leaving the hospital that following her hysterectomy she would never be able to have a child. I sent her home and the following day her mother informed me by telephone she "was cramping" very much. Dr. U. G. McClure of hospital staff upon his return said "that girl is pregnant." The patient was admitted to Dr. Dunn's hospital on July 5, 1919, and upon digital examination nothing could be made out but a small, red, patulous os. She was examined vaginally under general anæsthesia and I could not determine anything, even though my index finger went through the opening in the remaining portion of the cervix. The patient's abdomen was cleaned up. I made my incision low over the left side of the abdomen, midway between the old scar and the iliac prominence. Upon opening the peritoneum the first thing that presented itself was the thin amniotic sac filled with its fluid and unruptured. Directly above this and over toward the left abdominal wall was a thick wall of clotted blood.

I walled off the intestinal coils carefully with warm packs so as to prevent an ileus, clipped open the amniotic sac, picked up an 8½ pound baby, clamped and cut the cord. The baby was dead. A small slipping area on the side of the baby's body led me to believe that the baby had been dead anywhere from 36 to 48 hours.

The placenta was slowly and carefully separated from the left flank under the spleen, practically incarcerated by the greater omentum. Considerable bleeding followed, but hot packs controlled this in a few minutes while I made a stab drain opening well over to the left wing of the ilium and low down. A strip of rolled rubber drain was carried through this and another in the lower end of the wound, packs were removed, and the wound closed in the usual manner. The patient was removed to her room in good condition. She was in charge of a special nurse. Soda bicarbonate solution was given by rectal drip method. Small doses of morphine were given for pain during the following 36 hours. Gas was relieved by rectal tube drains removed in 48 hours. Patient made a splendid recovery in 3 weeks.

Dr. DeLee's talk on avoiding coming in contact with the intestines in cæsarean section was a great help to me in this case for without the knowledge obtained through his experiences and also those of Dr. Davis of Philadelphia and Dr. Zinke of Cincinnati, I would have boldly gone in over the tumor with possibly unsatisfactory results.

In regret not operating sooner. Why I should have put off for a few days while the patient was suffering from the great cramp-like pains in her abdomen is explained by the false history of exposure to pregnancy. From the history of coitus I figured the patient about 7½ months. The baby's weight was 8½ pounds and a full term girl baby.

Dr. R. H. Dunn assisted me in the operation and Dr. McClure gave the anæsthetic. Miss Wills was surgical nurse and Miss Graves the assistant nurse at the time of the operation. Drs. Dunn and McClure as well as myself would like very much to know how many such cases have been reported.

As stated above the patient was delivered of 8½ pound baby July 6, 1919. Patient states that she menstruated regularly every month from August 1, 1919, to August 20, 1920. She was married in January, 1920. Her husband stayed with her through July and August, 1920. He left for New York, the latter part of August.

October 23, 1920, the patient reports at my office stating that she has not menstruated since August 20, 1920. She is sick at her stomach early in the morning. Her appetite is good. She has gained in weight. She believes that she is pregnant. She has no abdominal pains. I examined her digitally and found the cervix soft and mushy, very much the same as that of a pregnant cervix. I advised her to come again in the next few weeks. She wants to get a divorce from her husband and I have advised her to make no such request.

October 29 the patient called at my office. I confirmed diagnosis of pregnancy. The cervix was red and boggy, and the patient was sick at her stomach in the morning.

December 14, 1920, I examined patient through vagina and rectum. I felt a mass through the rectum and could make out a mass through the vagina. The patient is getting "fat." There is no sickness now and patient's appetite is good. General health good. Breasts show signs of pregnancy. Patient has made frequent visits to hospital and I have noted continued increase in signs of pregnancy.

Miss I. S. now Mrs. C. reported to me on the 14th instant with her mother and upon explaining to her the question of presenting herself at this Clinic I fortunately secured the consent of the patient and her family. She left my office about 2 p.m. of that day and spent a very busy afternoon in the shopping district of our city, afterward walking to her home up a long steep hill. About 3 a.m. of the following morning, she awakened her mother with a sudden pain in her left side. Her mother called Dr. McClure and said she did not think it necessary for him to come out. The doctor made a few suggestions for her relief. He was called again at 5:30 a.m. and went to see her. He called me about 6:30. I saw the patient about 7:15. She was pulseless, very white, tossing in bed, her knees drawn up, abdomen distended, she was suffering with pain over her left side and begging for ice water. Morphine ¼ gr. with atropine 1-150 gr. was given hypodermatically. The patient was removed as carefully as possible to the hospital in the ambulance.

Not thinking it wise to wait longer, we prepared for immediate operation. The abdomen was cleaned up in the usual way and a long incision to the left of the median line made. The tissues were almost void of blood; the patient's condition was extremely bad. From the abdomen we secured about 2 pints of clear blood by having it flow in a

sterile basin. This was given back to the patient intravenously with a 2½ per cent solution of sodium citrate.

The fœtus in this last instance was not free in the amniotic sac—floating unattached in the abdominal cavity, but the mass presented the appearance of a normal uterus on the right side by a thin layer of what looked like normal uterine tissue with a short distal end of the right tube and about one-half a normal appearing ovary on the right side. At the left side of this mass was the protruding amniotic sac with a bulging mass of bleeding placental tissue that had a strong attachment to the sigmoid flexure of the rectum. From this point the hæmorrhage was still going on. I spread this with my fingers and ruptured the thin amniotic sac lifting out a boy baby, which afterward weighed 4 pounds. I then sutured all bleeding points and closed the artificial half uterus. Hot normal salt solution was added to the abdominal cavity and the incision closed in the usual manner. Patient died about 10:30 a.m.

DISCUSSION

Dr. Charles E. Paddock: I am not sure that I quite understood just how much of the uterus and adnexa were removed at the first operation. As I understand it, a low amputation was done and at least one tube and part of an ovary possibly left in. If this be so, a physician might with almost perfect safety guarantee to his patient that a future pregnancy was not to be thought of, still we have here an example of how guarded we must be in our statement to the patient.

In this case, a gauze drain was passed through the stump connecting with the peritoneal cavity. This may have left a connection whereby the ovum could readily come in contact with decidual tissue. The ovum imbedding itself would finally extend into the abdominal cavity attaching itself to surrounding tissue, thus becoming an abdominal pregnancy, or a tube or part of a tube being left, the pregnancy may have started in the tube. May I ask where the placenta was attached?

Dr. McMillan: In the first pregnancy the placenta was planted absolutely at the furthest point from any uterine tissue, up in the left flank under the spleen. After the baby was removed a wall of clotted blood came down from that corner of the abdomen and shortly afterward the placenta separated.

Dr. Paddock (resuming): In the second operation, may I ask another question: What did the woman die of? Was it from shock due to the rupture, or hæmorrhage at time of operation?

Dr. McMillan: The woman bled evidently from the first call at about 3 o'clock in the morning, and the abdomen was filled with blood. The girl was suffering a great deal and the doctor lifted the foot of the bed. When she was opened the abdomen was tightly packed with clotted blood around the diaphragm, and she suffered with severe pain in the region of the diaphragm.

Dr. Paddock (resuming): How often we think we might have done differently when listening to such a report as the one now before us, and perhaps had we been the operator we would not have done as well, or at least no better. I had thought perhaps it might have been better had the child been removed, the tears repaired as quickly as possible, no clots removed and the placenta left *in situ*, and the abdomen closed. Instances of the placenta having been left in the abdomen are cited and after a few weeks the placenta becoming entirely digested.

There is great danger of doing too much and the patient succumbs to too much manipulation. "Get in and get out as quickly as possible" is a good motto.

Dr. Rudolph W. Holmes: Some years ago some German operator hysterectomized a woman who some time later became pregnant in the cervix and possibly some slight portion of the lower uterine segment—she aborted in a few weeks.

As the essayist describes it, one would be led to believe that his case was an instance of primary abdominal pregnancy with an attachment of the placenta to some viscera. This is so contrary to the usually accepted view that nidation only may take place on muellerian tissue that we must believe that the nidation must have been primarily in the remnant of the tube left. The fact that the omentum supplied some of the nourishment would be proof positive that it was not primarily so attached unless microscopic proof were advanced to prove muellerian remnants were in the omentum. The recurrence of the phenomenal pregnancy likewise proves that the primary nidation must have been on muellerian tissue, that both had taken a course analogous to a continuation of growth of a tubal pregnancy after its rupture.

Horrocks, of London, has had an unusual experience with advanced ectopic pregnancy. In his many cases it is his custom to remove completely the placenta at the time of operation, he maintaining that it is readily possible to work along the line of cleavage between placenta and attached structures so that it is consumated with minimal amounts of bleeding if proper ligation be done. *A priori*, it would be better surgery to follow his teaching, rather than to pack and have the necrotic placenta disintegrate and come away later spontaneously, or by a secondary operation. On the other hand I imagine it would be a dangerous procedure to close the abdomen and trust that the placenta would prove innocent and be absorbed without undue symptoms.

Dr. McMillan: First, in regard to the length of the cervix, there was about 1½ inches of cervical tissue left. There was also about half of the right ovary left and about 1½ inches of the fimbriated end of the right tube.

Regarding the cause of death, I felt that the patient was dying; she was rapidly becoming worse. I felt that without an exploratory operation I would be a coward not to give her the possible

chance of tying off or packing off the bleeding point. Without the exploratory incision I would have been unable to tell what the abdominal contents were, for we, unfortunately, have a state law whereby we are unable to secure postmortems unless the friends give the privilege, and there is a decided feeling against granting postmortem examinations.

I want to say that in the first pregnancy the young woman had no pains up until the day before I did the first operation, and she went into labor with just normal labor pains and the length of time necessary. I wish also to state that there were no intestinal adhesions to the placenta or to any abdominal viscera. The placenta came away without any difficulty and there was not much bleeding after it was separated. It was easily packed off and after waiting a reasonable length of time to establish my stab drain down in the left abdominal wall I felt quite safe in taking out the hot packs. The placenta was in the left flank, over the left kidney and under the spleen. It came down from that region with very little trouble. I had made a long incision and I made careful observation at that time and there was no difficulty in separating the placenta.

Death was not due to hæmorrhage at the time of second operation, I feel certain of that. She had bled about all that there was to bleed. There was slight oozing and she had only about half of the right wall on the cervical portion of the tissue which presented a uterine structure. It bulged out over the attachment of the placenta to the rectum and that mass was the thin amniotic sac. In the second instance this was very tough and the omentum came down and was also adherent to the mass. I did not encounter any adhesions or attachments to any of the lower structures.

Dr. Charles S. Bacon: I would like to ask the doctor how he thinks the woman became pregnant.

Dr. R. H. Dunn: At the time of the first operation, when the hysterectomy was done, we put in a little rubber dam drain and there was a fistula of the cervix following the drainage resulting in loosening and breaking away of the interrupted sutures.

Dr. S. S. Schochet. The two cases here reported are very interesting in regard to the point of attachment of the placenta. We are dealing with a tubal pregnancy or a pregnancy which had become detached from the cervix and gained a new attachment. Many observers seriously doubt the validity of the so-called primary abdominal pregnancy.

Dr. Joseph L. Baer: I wish to call attention to the fact that in the case report it states that there was much available tissue, an inch and a half of the tube remaining so that it or the stump of the uterus could have been the implantation site.

Dr. N. Sproat Heaney: Dr. Schochet's explanation seems the right one. The doctor operated for pus tubes and the distal portion of one tube was left in. The doctor had quite a complicated operation at that time and thought he had removed the tube but had not. By the same token he left more of the uterus than he thought. He closed it up and put a drain in. I think there was enough of the uterus left to start the nutrition of the pregnancy since there was enough to menstruate. This woman had labor pains in her first pregnancy which can only be produced by a contracting body (the uterus) and when the labor pains stopped this uterus, which was markedly distended, ruptured into the amniotic cavity and the fœtus and placenta were all shed into the abdomen. The placenta was removed without any bleeding or any raw surface, which would speak for placenta that had been unattached. The second time the uterus had no closure of the fundus and the pregnancy started on a portion of the uterus and spread out onto the neighboring organs and we had more of an abdominal pregnancy than the first time, but it started in the portion of the uterus that was left above the cervical stump.

Dr. McMillan (closing): I wish to thank all the gentlemen for their liberal discussion. There is another point to remember; the woman had enough endometrical tissue to menstruate every month, she had 1½ inches of the fimbriated end of the tube and half or more of a good right ovary. She established a line of apparent uterine tissue in her second pregnancy that she did not have in her first pregnancy.

RESULTS WITH INTRAPERITONEAL GAS INFLATION AND THE X-RAY AS AIDS TO OBSTETRIC AND GYNECOLOGIC DIAGNOSIS

Dr. Reuben Peterson, of Ann Arbor, read a paper on "Results with Intraperitoneal Gas Inflation and the X-ray as aids to Obstetric and Gynecologic Diagnosis." (See p. 154.)

DISCUSSION

Dr. Joseph L. Baer: I am going to ask Dr. Peterson to give me reassurance in some work that I have been trying in a small way in the Michael Reese dispensary. I have been interesting myself particularly in the sterility cases, using the Rubin transuterine gas introduction, and I have been exceedingly fearful of introducing infection: first, with infected gas; second, by blowing up an infection into the uterine cavity from a cervix that I have just penetrated with a sterile cannula; third, through stumbling unawares upon a quite fresh gonorrhœal infection, with patent tubes but still with an active process just under way, and so on. I have checked myself as best as I could by, first, a history of the patient, eliminating everything that would point toward an infectious state of the pelvic viscera; second, by a bimanual examination, likewise attempting to eliminate such dangers; third, a temperature and a white blood count, holding myself to those cases in which the temperature and white blood count are normal.

I have used a cannula like Rubin's with the little rubber stop and so far I have been using oxygen. The introduction of the cannula is comparatively

easy, but I have found it necessary in some cases to go to 200 millimeters of mercury pressure, and then have found the tubes to be patent.

I am very much impressed by the device Dr. Peterson is using for measuring the gas. Dr. Rubin's is not so satisfactory, and I have never been so sure of the quantity used. His method is based on the "tempo" of the gas bubbles. You try to establish the rate and then maintain it, but as soon as the pressure increases the rate decreases, the flow very soon ceases, and so you have to keep adjusting.

I think Dr. Peterson does not wash the gas in sterile water, at least I did not hear him say anything about that, nor filter it through cotton, nor does he look upon it as infection-carrying *per se*. I wonder whether he looks upon it as sterile because of the pressure under which it has been, and whether pressure itself is a germ killer. I confess a total ignorance in that field.

I have a film here which it may interest you to see, for it shows how clearly the diaphragm is marked and how the liver is separated from the diaphragm by the rising oxygen introduced by way of uterus and tubes.

Dr. Carey Culbertson: That which makes for greater refinement of diagnosis is admirably brought out in Dr. Peterson's excellent presentation this evening. There is one point which I might mention. I have not used the method of inflation through the tubes which Dr. Peterson has demonstrated, but at the County Hospital I have examined some patients by transperitoneal inflation. The patient is placed upon a table that can be tipped either end down and everything is gotten ready. This is done in the fluoroscopic room. The trocar is passed under the fluoroscope and the inflation done under the fluoroscope, so that one can watch the inflation as it takes place and can stop when the degree of distention is satisfactory. It is remarkable how little distention one needs in order to bring out the diagnostic features. It is not necessary to use much gas. I have not noticed that the patients experience so much pain as Dr. Peterson has given us to understand is the case, unless they are tipped. I think it is the tipping, standing them either on their head or feet, that causes the discomfort, so the patients are kept quiet in bed for some little time to avoid that. The small tumors are very well brought out under this method. The large tumors do not seem to be shown so well, but they are readily palpable anyway. The thing that is most satisfactory perhaps is the demonstration of the adhesions, as Dr. Peterson brought out so beautifully in some of his plates showing the adhesions of the omentum.

Dr. Charles S. Bacon: Dr. Peterson showed the early stage of pregnancy and demonstrated the thickening of the isthmus in the early stages. My understanding is that the isthmus is thinned out in the early stages of pregnancy, and I do not quite understand the relation between his findings and that thinning out of the isthmus. I would like to have him explain this a little more fully.

Dr. Charles E. Paddock: I wish to substantiate what Dr. Peterson says as to the condition of the tissue at the junction of the body of the uterus with the cervix in the early pregnancy. There is a softening, not a thinning. This is called the Credé sign of pregnancy.

Dr. Gilbert Fitz-Patrick: I wish to know how Dr. Peterson regulates the temperature of the gas.

Dr. Peterson (closing): I can only say in reply to Dr. Baer that I think the danger of infection is largely theoretical. Rubin now has used the transuterine method in some 250 cases and I have used it in over 50 cases and have seen no carrying up of infection from the tubes into the pelvic cavity. I can imagine that if the method were used carelessly in acute cases, such as Dr. Baer mentioned, possibly the infection could be driven up through the tubes. When you come to study this method under anæsthesia you will see that the gas is not forced through violently. The ampullar portion of the tube is dilated first, and then the gas bubbles very gently pass through the fimbriated end of the tube and there is no rush that would carry out infectious material. Possibly this is the reason infectious material is not carried on. I have examined many cases under anæsthesia and have studied the mechanism of the passage of the gas through the tubes. There is a danger, but I think very slight danger, if we are careful in the selection of the cases, as I have tried to outline.

In regard to Dr. Rubin's apparatus, I can say that this apparatus that I showed here is Rubin's latest apparatus. He uses the siphon meter just as I have pictured it. The only difference is that I introduce the cannula in the Sims position, and that I allow enough gas to pass into the pelvis after the tubes have been proved to be permeable to enable the X-ray picture to be taken.

Dr. Baer also asked whether the gas is sterile. I had this carefully gone over in the bacteriological laboratory, and the gas as it issues from the needle is sterile, so I do not think there is any danger from that.

As to the temperature, the gas is not cold enough to produce any bad results whatever. I am sure that with the long tube used there is no danger to be feared from the temperature.

I am sorry I did not make it clear enough as to the danger of interrupting pregnancy. I can see that unless a careful history were taken and one injected the gas through the transuterine route in doubtful cases of pregnancy it would be an easy matter to eatablish the diagnosis of pregnancy at once, or very soon. I was not speaking of such cases. I have yet to introduce the gas through the uterus in a case where I suspected pregnancy. In such instances I have put it through the abdominal wall.

We have used the X-ray plates in connection with this work because we want permanent records. It is perfectly possible to demonstrate 150 cubic centimeters of gas passed through the tubes, and you can see by the fluoroscope the depression of the

liver, as on the plates that were passed around, but we use the plates because we want a permanent record.

Dr. Culbertson spoke of tipping the patient as the cause of bringing on the pain. I was careful to demonstrate that the patients do not have pain, but have what I describe as discomfort. I think that pain is distinctly different. Once in a while we have had, where the abdominal examination has shown a great many adhesions and an irritable peritoneum, a patient who complained very bitterly of pain, but in the great majority of patients where you would use this method there is only discomfort. This does not come from the tipping for it comes when only 300 cubic centimeters of gas have been injected, and when you get up to 1,000 cubic centimeters the discomfort is not so great because the gas does not press upon the diaphragm, but rises up in the pelvis because the head of the patient is tipped down.

Now, as to Dr. Bacon's question about the thinning of the lower uterine segment and why it shows the thickened shadow. Besides the thickening there is a broadening of the segment. We can demonstrate this at 2 months very easily. We can feel with the examining finger this spreading out and the X-ray does not have to have a thick tissue but tissues that are separated by the gas. I think that is why we see this cross section at the isthmus.

Dr. Curtis asked me to describe a little more carefully the transperitoneal introduction of the gas. The abdomen is carefully sterilized with iodine and then the needle, which is the ordinary needle that we use for spinal puncture, is passed through the fold of the abdominal wall which is held between the forefinger and the thumb. The needle has to be sharp, or else it gives rise to pain. It is passed slowly down to the fascia. After you reach this point it is passed through the fascia and peritoneum and after you have done it two or three times you will know accurately when the peritoneum has been pierced. Once or twice we have had a plate that did not show anything after 1,000 cubic centimeters of gas had been passed into the abdominal cavity. I do not know why, but the plate showed nothing and we knew that the gas had been injected. It was suggested that perhaps I had passed it into the bowel, but I am quite certain that is not so for if we passed 1,000 cubic centimeters of gas into the bowel there would have been more pain than was experienced in these cases.

It seems to me we have just begun this study and if more men will take it up and give us their experience it will help to clear up these mooted points. After my demonstration of more than 100 cases I hope the members of this society will try it. It is a very simple procedure. It simply requires the co-operation of an experienced roentgenologist to help interpret the plates. If hundreds of these plates are made and developed and studied in connection with the clinical findings, within a short time we will have knowledge in regard to preoperative diagnosis that we have never dreamed of before.

SILVER FOIL, A PREVENTIVE OF FORMATION OF PERITONEAL ADHESIONS

Dr. Arthur J. Puls read a paper entitled "Silver Foil, a Preventive of Formation of Peritoneal Adhesions." (See p. 186).

DISCUSSION

Dr. Arthur H. Curtis: I think it never does us harm to have reiterated that it pays to be careful in abdominal work. Concerning the use of silver foil, I have personally had no experience, and I presume that very few members of the society have used it, at least at all extensively. During the past several years my partner and I have given up entirely the use of lap pads. We now never use pads in the pelvis, but when necessary employ a very heavy type of rubber dam, and have been pleased to note that patients do not come back to the office complaining of adhesions as they did in former times. When, in other cases, we need a pack vaginally, we also use a rubber dam or rubber glove. Whenever we find it necessary to use sponges, we have given up entirely the use of dry sponges. I think we will all improve our technique by using only wet sponges, and we should sponge only the place upon which we are working, and even there as little as we possibly can.

Dr. Charles E. Paddock: Those of us who are attempting to do the newer cæsarean operations, and the opponents who claim that the great trouble with our operations is that they are followed by adhesions, would welcome some procedure like this to prevent the adhesions. We would feel then that we had entirely overcome the opposition of those who are doing the transperitoneal and extraperitoneal operation.

Dr. Puls (closing): I have nothing to add except that I am glad the doctor uses the rubber dam instead of the old pads, which certainly do harm.

In the cæsarean sections I do not think we will get adhesions if we have a clean patient and follow the surgical principles I laid down and have a dry wound. In cases where it is doubtful whether the patient is clean and healthy, I think the silver foil will do no harm. Of course, we can tell later on if the adhesions have remained away. All of my patients have remained well, and the ones who have suffered from adhesions have been relieved.

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD MAY 6, 1921, DR. WILLIAM FULLER, PRESIDING

EXPERIMENTS WITH AN ORGANISM ASSOCIATED WITH THE CROCKER TRANSPLANTABLE MOUSE TUMOR

Dr. John W. Nuzum detailed the experimental work he has been doing with an organism associated with the Crocker transplantable mouse tumor. (See p. 167.)

DISCUSSION

DR. ALBERT J. OCHSNER: To my mind Dr. Nuzum's demonstration is the most important piece of work that has been brought before the Chicago Surgical Society since its foundation. It represents an enormous amount of work extending over a period of 2 years including many hundreds of carefully conducted observations and resulting in the establishment of a scientific foundation for future work to establish the etiology of cancer.

He has brought out many important facts which fit perfectly into what we as clinicians have known for a long time. Hundreds of attempts at transplanting carcinoma from one patient to another or from one animal to another failed until proper conditions were established.

In order to succeed there must be enough carcinoma tissue to supply food for the infectious material until the resistance of the surrounding tissues of the new host has been overcome and enough to maintain its growth after the natural condition of the tissues surrounding the transplant has become suitable for the invasion by the cancer to give it a permanent foothold. In case these conditions are not established the growth will develop at first only to be absorbed sooner or later.

The fact experimentally demonstrated by Dr. Nuzum that by traumatizing or partly removing the growths which have been produced by inoculation with these cultures will cause the artificial growth to take on a more intensely malignant character is very significant. Clinically we have long known that pigmented moles when crushed or partially removed will acquire identical characteristics by changing from an apparently harmless condition into violently malignant growths. The trauma must have overcome natural barriers which previously prevented invasion of surrounding tissues and metastatic dissemination. The same is true in connection with the partial removal or traumatizing of cancer in man. Until this change is caused by trauma the transplanted tumors increase by expansion rather than by invasion.

In visceral inoculation metastases occur more frequently than in subcutaneous probably because there is less connective tissue to obstruct progress and because the vessel walls are thinner and more numerous.

We know that planting any kind of seed under improper conditions will not result in proper growth, hence the difficulties encountered heretofore in obtaining cultures from cancer and developing these so as to eliminate the tissue cells and then to inoculate healthy tissue in a manner to produce typical cancer.

It seems that Dr. Nuzum has made important additions to existing methods which are likely to have most valuable results because they will enable others to continue the research and possibly to produce vaccines or antitoxins.

These observations seem to be an advance on those of Payton Rous and F. Keysser which are also of the greatest importance in pointing the way.

The fact that there is no growth in ordinary culture fluids undoubtedly explains many past failures.

The further fact that the ascitic fluid used for cultures must be bile-free may be of far reaching importance. Possibly, this may explain the rare occurrence of cancer in the portion of the alimentary canal which is constantly being bathed with bile. It may explain why cancer occurs frequently on the gastric side of the pylorus and only very rarely on the duodenal side.

Nuzum has isolated a definite micro-organism grown under definite conditions the introduction of which into normal tissues under proper conditions results in the formation of tumors having the power to form metastases and to destroy life in a manner identical with that caused by cancer.

It seems especially interesting that traumatizing of these artificial growths has the same results as traumatizing malignant growths.

The fact that it has been possible to isolate what appears to be the identical micro-organism regularly in human cancer and that with proper culture media this micro-organsm can be grown and that it will produce typical growths upon inoculation seems convincing evidence to my mind that Dr. Nuzum has in fact isolated the cause of cancer.

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD MARCH 4, 1921, DR. WILLIAM FULLER, PRESIDING

DR. ALBERT E. HALSTEAD and DR. FREDERICK CHRISTOPHER read a joint paper entitled "Report of a Case: Pylephlebitis of Appendiceal Origin Simulating Lung Abscess."

LOCAL ANÆSTHESIA FOR THE CONTROL OF CHRONIC PAIN

DR. FREDERICK G. DYAS read a paper entitled "Local Anæsthesia for the Control of Chronic Pain." (see p. 184.)

DISCUSSION

DR. M. L. HARRIS: The subject matter is one of considerable importance and should receive greater recognition in the relief of pain. We have all heard and read a great deal about operations done under local anæsthesia and how successful the method is, yet it is surprising how few surgeons are availing themselves of this extremely important addition and improvement in the way of operating.

Chronic pain can be relieved by the blocking of nerves, as well as acute pain, and I am surprised the method is not more frequently used. I have seen patients who were doped with morphine in order to relieve pain when the pain could have been relieved very easily by simply blocking the nerves with some local anæsthetic thus leaving the mind of the patient perfectly clear.

For some time I have been doing this not only with the use of alcohol but with local anæsthetics combined with certain substances, such as calcium and magnesium, which prolong the anæsthesia. I have been able to relieve intense intercostal neuralgia in patients who had been kept night after night with anodynes by injecting the intercostal nerve after its exit from the spinal foramen.

Chronic pains about the feet, particularly in the region of the heel due perhaps to gonorrhœal infection may be relieved by the injection of a local anæsthetic. The patient gets not only immediate relief of the pain which comes from the local anæsthetic, procaine, for instance, but after that effect has worn off, there will come a relief from the pain which may extend over days.

It seems to me, this method should be used more frequently. It is one of the best methods of relieving chronic and acute pain with which I am familiar, namely, blocking the nerves with proper combinations of local anæsthetics.

DR. ROGER T. VAUGHAN: The members of this society all know what a reputation for uncertainty as to both diagnosis and prognosis the condition called coccygodynia has, the variety of conditions that cause it, and how capriciously it yields to treatment. In a patient whom I am still treating the pain is localized to the tip of the coccyx, where I can make out rather definitely both on rectal and external examination a small circumscribed area of tenderness. I injected this tender area with novocaine as a prognostic measure. I believed that if I could relieve the pain by novocaine, I could secure permanent relief by subsequent alcohol injections. Yeomans has reported a score or so successes in coccygodynia from the use of alcohol injections.

Novocaine gave the patient complete relief for 24 hours. I followed that a week later with alcohol about 70 per cent, and the patient again had complete relief for 24 hours, and partial relief for the ensuing week. Encouraged by this success, I injected 95 per cent alcohol, hoping to secure more lasting improvement, and made bolder because the preceding analgesias obtained had not been accompanied by any area of cutaneous anæsthesia or other untoward signs. The usual analgesia lasted over night, but the patient for the ensuing 10 days suffered more pain than previously.

A series of injections appears to be necessary in these cases, as Yeomans has observed; but so far as I have been able to ascertain from the literature, novocaine has not been used as a diagnostic or prognostic measure in these cases. I, therefore, mention this single case chiefly to secure Dr. Dyas' opinion and the opinions of the members of this society as to whether they believe such an injection of novocaine has diagnostic or prognostic value in cases of neuralgia in which alcohol treatment is under consideration.

DR. DYAS (closing): To bear out what Dr. Harris has said, I believe these injections should be persisted in frequently. For some reason or another, even with novocaine permanent relief ensues. In the work Dr. Vaughan has done he might with considerable justification carry out his initial treatment with the novocaine or with solutions of alcohol, but not quite as strong. It seems to me, this method will be used more and more in the future, and we will be required by the public in general to be able to control pain in a more accurate and scientific way rather than give a patient ever-increasing doses of some form of opium. I believe these nerve injections have some action on the nerve which tends to restore things to a normal condition.

In cases of intercostal neuralgia and coccygodynia and other painful conditions, this method ought to be tried out to the limit.

DR. DAVID C. STRAUSS read a paper entitled "Subcutaneous Rupture of the Liver."

CORRESPONDENCE

SARCOMA OF UPPER END OF HUMERUS; OPERATION; NO RECURRENCE

To the Editor: In the January, 1920, number of SURGERY, GYNECOLOGY AND OBSTETRICS on page 7, Albee in his article entitled "Restoration of Shoulder Function" reports a case of resection of the humerus for sarcoma, and further notes that "William B. Coley in recent correspondence states that it is the only case that he knows of in which a resection for sarcoma of the humerus was done and no recurrence occurred after 18 months." For this reason, if for no other, the following case report will undoubtedly be of interest to your readers.

February 20, 1916. Mrs. A. K., age 40, the mother of 8 children, born in Russian Poland, states that for the past 8 months she has had intolerable pain in her right shoulder, day and night. She is unable to sleep for more than a half hour at a time on account of this intolerable boring pain. She is losing in weight and well-being and begs for some operation, no matter what its consequences might be, which would offer her some hope of relief from the intolerable pain.

She gives the usual personal history of a hard-working, married woman, mother of a large family. She has never had any serious illness, never had any miscarriages or any of the usual signs and stigmata which might lead one to suspect syphilis. She has never had a chronic cough, nor purulent expectoration. She states that for many months past she has been a patient at one of the largest hospitals in this country, where a diagnosis of inoperable tumor of the shoulder-joint was made. She states that repeated blood tests have been made and that they all were negative, but that, on the suspicion that the condition might be of syphilitic nature, she was given six injections of salvarsan without avail.

She was examined by me at my office on February 20, 1916. There was a complete loss of motion of the right shoulder and a large, hard, tender mass was felt over and to the inner side of the head of the humerus. There were no glandular enlargements and no lesions suspicious of syphilis. The examination of the lungs was negative, heart and internal organs normal except for relaxed vaginal outlet and a cystocele.

X-ray photograph of this date is shown in Figure 1. The diagnosis lay between sarcoma, cyst, syphilis, and tuberculosis. The subcutaneous tuberculin test, made with increasing doses, was negative for a dose of 2 milligrams of Koch's old tuberculin. The Wassermann reaction was negative

Fig. 1.

Fig. 2.

Fig. 3

Fig. 1. Roentgenogram of patient taken at the time of examination.

Fig. 2. Photograph of tumor.

Fig. 3. Recent roentgenogram of patient's shoulder.

and an authentic copy of her previous hospital record shows that repeated Wassermann examinations were negative, even after provocative doses of salvarsan, and that salvarsan given in large doses during a period of 4 months did not ameliorate her symptoms, but rather the tumor had grown in size and the pain had increased in severity while she was being thus treated. A diagnosis of sarcoma of the upper end of the humerus having been made, an operation was performed on March 12, 1916, at St. Luke's Hospital, Cleveland, Ohio, the upper 4 inches of the humerus being resected and removed. The tumor mass was a solid one, no cysts, and did not involve the glenoid cavity or the corocoid process.

A 6-inch graft was taken from the shin and implanted into the medullary cavity of the upper end of the humerus and fixed under tension in a hole bored into the glenoid cavity of the scapula.

The tumor was photographed, Figure 2, and the pathological report showed the growth to be a mixed cell sarcoma. This diagnosis has been confirmed by Dr. Karstner, pathologist at Western Reserve University.

The patient made an uneventful recovery and was soon able to leave the hospital with the arm and shoulder in a plaster cast. Eight weeks afterward the cast was removed, the muscles massaged to regain their tone. Since the twelfth week after the operation the patient has been able to do her housework and is now able to take care of her family of husband and eight children unassisted, doing the washing and ironing. X-ray photographs taken within the last 6 months, Figure 3, show a good union of the graft with the humerus, no union of the graft with the scapula and that the tumor has *not* recurred locally. Careful physical examination shows that the tumor has not recurred in any part of the body, the lungs being negative to the X-ray plate. The patient now makes no complaint of any trouble referable to the osseous system.

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TECHNIQUE FOR HYSTERECTOMY WITH INFECTED AND MALIGNANT CERVICES

To the Editor: I am prompted to mention the method which I shall describe, after having read an article on "The Treatment of Suppurating Wounds Following Abdominal Section," by Dr. Thomas J. Watkins, in SURGERY, GYNECOLOGY AND OBSTETRICS, 1921, xxxii, 87. Dr. Watkins refers to the danger of infections following hysterectomy for cancer of the cervix and infected protruding fibroid polypi. I would mention any variety of infected cervix in addition thereto.

I would submit the following procedure:

1. Cleanse the vagina by any of the standard methods, presupposing proper pre-operative preparation.
2. Cauterize the cervix with a hot iron.
3. Make an incision at the cervicovaginal junction as in a vaginal hysterectomy, except the lateral attachments are not severed, thereby avoiding the uterine vessels at this point.
4. Encircle the cervix with an elongated gauze wipe and pack same loosely into incision.
5. Grasp the cervix firmly with a volsellum and lock securely.
6. Proceed with hysterectomy in ordinary manner through the abdomen. When uterus is freed of all attachments, have an assistant grasp the volsellum and deliver same through the vagina.

The advantages are obvious.

CHARLES W. DOUGHTIE, M.D., F.A.C.S.
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AMERICAN COLLEGE OF SURGEONS

SOUTH AMERICAN SURGEONS

REPORT OF OFFICIAL VISIT TO ECUADOR AND BOLIVIA IN BEHALF OF THE AMERICAN COLLEGE OF SURGEONS, BY FRANCIS P. CORRIGAN, M.D., F.A.C.S., CLEVELAND, OHIO

I. FOREWORD

1. The Mission

IT is a great pleasure to be able to report to the Fellows of the American College of Surgeons the completion of the mission on which I was sent to Ecuador and Bolivia, as the result of which the most prominent surgeons of these two countries have accepted with enthusiasm the invitation of our organization to affiliate themselves with it. A number of the leaders of the profession in the more important cities are now engaged in expanding the movement and are acting as Committees on Credentials in the work of adding to our membership the men of the character whom the American College of Surgeons wishes to include. It does not bespeak overconfidence to express the belief that within a short time we will have in our ranks practically all of the leading surgeons of both Republics, and while they will be numerically small they will represent the highest type of citizen. As they are men of wide influence, their action in affiliating with the College will be of great assistance in the development of good will, not only among the members of the medical profession but in far wider circles.

2. Surgeons of Ecuador and Bolivia

The surgeons of Ecuador and Bolivia are a splendid body of men. In their profession they represent as fine a type as could be the boast of any country; they are advanced in training and methods; men of broad culture and of the gracious and hospitable manners for which cultivated gentlemen of Hispanic-American blood are noted. My experience while in charge of the Chile Exploration Company Hospital at Chuquicamata, Chile, in 1918-19, had led me to expect as much. This hospital is located in a large copper mining camp 10,000 feet up in the Andes, a day's journey from the coast. It was established by the Exploration Company, a Guggenheim corporation, to care for its people in that section. When I accepted the post I discounted somewhat the description of the hospital that was given to me and expected something rather crude; but on my arrival at the mines I found that the Guggenheims had erected a fine modern hospital which had an equipment as complete as that of any hospital to be found in the United States, this equipment involving the usual large annual deficit which seems to be essential to the success of every hospital.

The fact that this hospital was North American and new, made it an object of interest to many physicians and surgeons of Chile and neighboring countries, also to many educated laymen. They came to visit us and I began to meet and know my South American colleagues. I encountered many able men of charm and interest and was increasingly glad of every opportunity to amplify my knowledge of them. I look back with pleasure on my many pleasant social experiences with these courtly people. My contact with these visitors and our own splendid neighbors gave me a foreknowledge of the kind of men I would meet among the surgeons of Ecuador and Bolivia.

3. Reception as a Representative of the American College of Surgeons

The movement to bring the South American surgeons into the American College of Surgeons was started in 1920, when Dr. William J. Mayo and Dr. Franklin H. Martin went to Peru, Chile, Argentine, and Uruguay. They wished also to visit Ecuador and Bolivia, but the capital of each of these countries is in the interior, not easy of access, and the journey would have taken more time than they had at their disposal. No doubt my South American expedition in behalf of the College brought me the honor of extending to the surgeons of these republics an invitation to become affiliated with the American College of Surgeons, but the mission of Dr. Mayo and Dr. Martin was not news to the men whom I met, and

in a great measure I am indebted to the pioneer work of those incomparably splendid representatives for the success with which I met. They had paved the way, and the countries which they did not visit on this initial trip were merely awaiting a formal invitation to join in the movement.

II. Ecuador

1. Quito—Señor José Gabriel Navarro

The first city I visited was Guayaquil, the principal port of Ecuador, and from there I went to Quito, the capital. In my brief stop at Guayaquil I arranged for a meeting of the surgeons to be held on my return from Quito.

The journey to Quito by a zig-zag railway which climbs out of the tropical jungle up into the mountains is one to make an enthusiast of even the most blasé traveller. On the second day of the journey, after leaving Riobamba and approaching Quito, the route brings into view some of the highest and most beautiful peaks of the whole Andean Cordillera.

I had a wonderful guide on this journey in the person of Señor José Gabriel Navarro, Director and Founder of the College of Los Belles Artes in Quito. I was intensely interested in the information he gave me about the old Inca kingdom which formerly occupied and still lends a wonderful color to this great, high plain between the two chains of the Andes. But more than this I was heartened by the significance which he attached to my visit as indicating the kind of a reception I might expect in Quito. I was a rare kind of a visitor because I was not a tourist, I was looking for no concession, and I had nothing to sell.

2. Mr. Charles Hartman—Señor Pablo A. Vascoñez—Señor Don Carlos Tobar y Borgoña

Mr. Charles Hartman, the American Minister, is the Dean of the Diplomatic Corps of Quito and a representative of whom his country may well be proud. He treated me to some genuine American hospitality and took a real interest in my mission. Through his kindness I had the pleasure of meeting some of the charming and cultured people of the Ecuadorean capital, as fine and distinguished a group of men as it has been my good fortune to encounter anywhere.

Among the public men who interested themselves in the object of my mission were Señor Pablo A. Vascoñez, Minister of Public Instruction, and Señor Don Carlos Tobar y Borgoña, Rector of the National University. These two men are among the most distinguished educators and public men of Ecuador. The Ministry of Public Instruction is a cabinet office and I was privileged to visit with Señor Vascoñez in his Department headquarters in the historic old National Palace built in Spanish colonial times.

Señor Tobar, now Rector of the University, had but recently retired from the position of Minister of Foreign Affairs, which corresponds somewhat to the post of Secretary of State in our own cabinet. In this position he had been in almost daily contact with our Minister, Mr. Hartman, and they proved to be old friends. He was kind enough to invite me to his home and I thoroughly enjoyed an informal visit in his wonderful old-world mansion accompanied by my splendid sponsors, Señor Navarro and the American Minister. I wish that I could convey the charm I felt in the presence of Señor Tobar who is possessed of a most engaging personality. He is tall, slender, fine-looking, trained for a diplomatic career, and a man of the world in the very best sense of that description. I describe him because he epitomizes the attributes of his race. He is intensely interested in cultural and educational matters and visualized the importance of our movement from the general educational standpoint. In the course of our conversation he discussed the possibility of the Government itself sending one of the Professors of the Medical Faculty as an official representative to the next Convocation of the College.

3. Preliminary Conference—Official Committee

Although it happened to be holiday time when I arrived in Quito, Señor Tobar, in his capacity of Rector of the University, arranged to have a representative group of the Medical Faculty hold a conference with me so that I might have the privilege of explaining to them the aims and ideals of the American College of Surgeons.

This official committee was headed by Dr. Angel Saenz, Dean of the Medical Corps, a distinguished ophthalmologist and chief of the eye department, a man who has won an enviable name for himself in this part of the world. Dr. Carlos A. Serrano, Surgeon Major of the army, Dr. Eustorgio Salgado, distinguished specialist in genito-urinary surgery, and Dr. Pablo Arturo Suarez, in charge of the department of X-ray, were also members of this committee.

They did me the honor of waiting upon me in my hotel in the beautifully formal manner which is one of the charms of Hispanic-American life. They took a very serious interest in the methods of organization, the plans, and the ideals of the College. They had known of the organization only in a very general way and asked me many

Nuevo Hospital Civil de Quito, Ecuador.

questions bearing upon detail. The interest evinced even by those who were not engaged in surgery aroused in me a feeling of regret when I explained to them that membership in our ranks was open only to men of the right caliber who were engaged in surgery or one of the surgical specialties. They were keenly interested in the proposed plan of co-operation and impressed me as men of culture and discernment. The practical post-graduate results achieved by the clinics and demonstrations at the Clinical Congresses were clearly appreciated and I have no doubt that the future Convocations will be increasingly Pan-American in a more complete sense than in the past.

4. *Nuevo Hospital Civil—Dr. Ricardo Villavicencio Ponce*

Before leaving Quito I had the pleasure of visiting the Nuevo Hospital Civil now in course of construction. Dr. Ricardo Villavicencio Ponce acted as my guide and showed me the plans for the finished structure. It is a magnificent plan which calls for the expenditure by the Government of about seven millions of dollars, and contemplates a complete hospital with all departments affiliated with the medical department of the University. Dr. Villavicencio, a graduate of the University of Brussels, is Professor of Surgery in the University. The construction is far enough advanced so that with his aid I was able to get a good idea of the contemplated structure. One of the striking features is a graceful pergola with a slightly curving double row of solid columns supporting a solarium at least a thousand feet in length. The buildings are located on an elevated site so that they overlook the city and face the beautiful Mount Pichincha across the valley. A tunnel is being constructed which will penetrate the knoll on which the hospital stands. This tunnel will pass under all of the buildings and will carry the drainage from the hospital beyond the valley in which the city lies With its beautiful location

and in this wonderful climate it should be a notable institution when it is completed.

5. The Maternidad—Dr. Isidro Ayora

Another fine institution in Quito is the new Maternidad, a hospital devoted to gynecology and obstetrics. It was organized by its able Director, Dr. Isidro Ayora, who is also Professor of Gynecology and Obstetrics in the University. Dr. Villavicencio and Dr. Ayora are now associated in the expansion of the work of the College in Ecuador and are worthy representatives of their country.

6. Guayaquil—Dr. Frederick W. Goding

Before leaving Guayaquil for the interior, having arrived between trains, which leave several times a week, I had an opportunity to look around for a few days before leaving for the capital. The pleasure of my visit to Ecuador was greatly enhanced by meeting with Dr. Frederick W. Goding, Consul-General of the United States, who has his headquarters in Guayaquil. Dr. Goding is an American physician who was peacefully practicing his profession in Illinois at the time of the Spanish-American war, when the martyred President McKinley's knowledge of his special ability along certain lines precipitated him into Government service, first in the Philippines and later in other Spanish-speaking countries. It was undoubtedly a loss to the good people of Illinois, but a gain to the consular service which needs more of the fine type of men represented by Dr. Goding. Along with his official duties he has found time to keep in touch with the world of science, and during the seven years of his stay in Ecuador he has written several monographs covering original researches made by him on the very interesting insect life of that country.

7. Dr. Juan B. Arzube Cordero—Dr. Miguel H. Alcívar

Through Dr. Goding I had an opportunity to become acquainted with Dr. Juan B. Arzube Cordero, Dean of the Medical Faculty and Professor of Gynecology in the local University. My meeting with Dr. Arzube was epochal as he was the first prominent member of the profession of Ecuador with whom I came in contact and his reception of me and my mission would go a long way toward demonstrating what reaction I might expect from the other members of the profession in his country. I need have had no trepidation on this score. Dr. Arzube, a splendid gentleman, would have received me courteously whatever my mission, and as it was he received me with enthusiasm. He repeated in almost as many words what the Prefect of Police had said to me when I went to his office for the formality of recovering my passport: "Your visit, Señor, is one of great significance to the medical profession of our country. It is indeed a grand idea to attempt to unite the surgeons of the two continents into one great organization so that we may profit by interchange of ideas."

Guayaquil is the seat of a University which has a complete medical department with approximately the same number of students as the Central University at Quito, that is to say between eighty and ninety. Dr. Arzube is Dean of the Faculty and Professor of Gynecology. He is of the most progressive type, and when he was apprised of the plans and hopes of the officials of the College he became deeply interested and entered into co-operation in the heartiest manner.

The first man to whom he introduced me after my return was Dr. Miguel H. Alcívar, the Professor of Surgery and perhaps the most widely known of the Ecuadorean surgeons both inside and outside of the limits of his own country. His exceptional skill and ability have brought him deserved renown. Dr. Alcívar's visits to the various clinical centers of this country and his friendship and admiration for Dr. William J. Mayo and other prominent North American surgeons whose names had been identified with the organization of the American College of Surgeons made anything that I might say quite unnecessary; he was already a strong advocate of the idea of affiliation.

I am deeply indebted to these courteous gentlemen for their aid in the accomplishment of my mission. They invited me to attend what in their country is called a "breakfast" to be given in my honor at the leading club where I might meet some of the members of the medical profession. The *almuerzo* (or "breakfast" as it is translated) is really a very elaborate course luncheon which lasts for several hours and is one of the popular methods of entertaining guests in all of the Latin-American countries. This one was served in a beautiful dining-room overlooking the water, the club being located on the Malecón, a street which runs parallel to the water-front.

The men at the luncheon were not all surgeons but they were all interested in the movement of *rapprochement* inaugurated by one of the important North American scientific bodies. I was struck by the cordiality shown to me on all sides as an American medical man. I was struck

also by their familiarity with the names of leaders of the profession in the United States. They made inquiries about the work and personalities of such men as Murphy, the Mayos, Crile, Ochsner, Cushing, and many others. The name of Gorgas is, of course, a household word in Ecuador and the feeling of gratitude engendered in the hearts of these people by the fine work of the sanitarians of the Rockefeller Institute is certainly something of which every American may well feel proud.

I felt a patriotic glow as I talked with these men, some of whom were engaged in carrying on the work that had been started by my countrymen. I realized how much the elimination of yellow fever, for instance, had benefited this city and how the appreciation of that work was now making easier the closer affiliation of our professional life. This conception of mine was strengthened when later I made a tour of the hospitals of Guayaquil. The hospitals of Guayaquil are of the tropical type of construction. They comprise all departments and are in charge of well-trained, competent men. I might say in passing that the development of nurses' training schools is one of the notable things that requires attention. However, the need of a competent nursing body is recognized and steps are being taken to remedy this defect.

8. General Hospital—Dr. Juan Rubio

In the General Hospital of Guayaquil the ability and reputation of Dr. Juan Rubio have contributed to build up an ophthalmological department that is somewhat out of proportion to the size of the hospital, but which in its completeness and general arrangement gives evidence of the excellence of this talented man. Diseases of the eye seem to be very prevalent in this country, perhaps aggravated by the constant brilliant sunlight. For this reason, perhaps, I found that Dr. Rubio's service in Guayaquil, like that of Dr. Saenz in Quito, was of greater importance than would be the eye service in a university hospital of corresponding size at home.

9. Committee on Credentials

I left Ecuador with regret but cheered by the reception accorded to me by the press and the public, as well as by the profession. Dr. Alcívar and Dr. Arzube of Guayaquil having agreed to co-operate with Dr. Villavicencio and Dr. Ayora of Quito in the formation of a nationally representative committee to promote the affiliation, I departed with the feeling that the future development of the College was in the hands of men who could well represent its ideals.

Dr. Miguel H. Alcívar, Professor of Operative Medicine, Faculty of Medicine of Guayaquil, Ecuador.

III. Bolivia

1. LaPaz—Lake Titicaca

It was with considerable more confidence that the approach was made to LaPaz, the capital city of Bolivia, and incidentally the highest capital in the world. Bolivia, the mediterranean country and the third in area of South America, has no seaport. There are three routes of approach to the capital, the most interesting perhaps being by way of the famous Lake Titicaca, a lake which is twelve thousand feet above sea level and is navigable for large steamers.

2. Mr. Samuel Abbott Maginnis—Señor Celso Lugones—Dr. Manuel Mariaca

Mr. Samuel Abbott Maginnis, the popular American Minister to Bolivia, was sponsor for our cause in LaPaz. Through his courtesy introductions were secured to Señor Celso Lugones, Rector of the University, and Dr. Manuel Mariaca, Dean of the Medical Corps. A repetition of the same kind of interest that had been shown in

the sister republic was here manifested. Señor Lugones, who was interested in the mission from the general cultural standpoint, offered to lend the support of his official position to further our objects in every way possible. Dr. Mariaca, in his capacity as Dean, called a meeting of the surgeons and surgical specialists of the medical school faculty to confer with me. There was quick action. Our South American brethren are not always as dilatory as we have been led to believe. It was announced that the conference would be held in the Rectorate of the National University the next afternoon at four o'clock.

Señor Lugones turned over his conference rooms and there in the Rectorate of the National University of San Andrea, on February 5 at the designated hour, 4 p.m., Dr. Mariaca called together the group of leading surgeons of LaPaz to hear the message of their colleagues from North America. Dr. Mariaca who is not a surgeon then turned the meeting over to the assembled surgeons and they proceeded to organize, following the parliamentary procedure with which we are all familiar.

3. *Dr. Claudio Sanjines—Dr. Felix Veintemillas*

Dr. Claudio Sanjines, who is Professor of Surgery in the University and perhaps the most widely known surgeon in Bolivia, was elected President and Dr. Felix Veintemillas, a younger man, a nose and throat specialist, was elected Secretary. Having received the letters and credentials from the College, Dr. Sanjines welcomed me to Bolivia in the name of the surgical fraternity of that Republic and expressed the satisfaction felt by himself and his colleagues at the invitation to co-operate in the work of the College. The discussion then became general, views were exchanged quite freely, and many questions bearing upon different phases of medical organization in North America were put to me. Finally the complete and detailed plan as outlined in the letter of Dr. Franklin H. Martin, Secretary-General of the American College of Surgeons, to the surgeons of Bolivia was the subject of marked approbation, offering as it did Fellowship to their surgeons on an equal basis and governed by the same requisites as in North America. The plan of affiliation was put to a vote and passed unanimously.

4. *Committee on Credentials*

Dr. Sanjines was made President of a permanent Committee on Credentials to carry along the work of the College in Bolivia. In his speech of acceptance he again expressed his hearty approbation of the work and told of his desire to interest the surgeons in the other cities of the Republic.

5. *Interest in North American Medical Publications*

Referring to the section of Dr. Martin's letter which asked for suggestions to foment a closer relationship between the surgeons of the two continents, he stated that in the name of the surgeons of Bolivia, he would like to suggest that inasmuch as the American College of Surgeons was now Pan-American in its scope, its publications, or at least the more important ones, be translated into Spanish. Also that the College encourage the translation of our best textbooks into Spanish, as the South American surgeons are only slightly familiar with our books. He mentioned the fact that Keen's *Surgery* and Kelly's *Gynecology* had been translated and the quality of these publications had made them eager to obtain translations of more of our important works. It is a pleasant duty to transmit these messages from the surgeons of Bolivia to their colleagues in the United States and Canada and to express satisfaction at their approval of the plan of affiliation.

6. *Dr. Daniel Bilboa—Hospitals*

On the following days of my stay in LaPaz, in company with Dr. Sanjines, Dr. Veintemillas, and Dr. Daniel Bilboa, another member of the committee that had been created, I visited a number of the hospitals and private clinics. The hospital situation in LaPaz is far from satisfactory. The number of beds is inadequate, a state of affairs with which we are not unfamiliar in this country. The condition of the hospital situation is well recognized by the local profession. Many of the present hospital buildings are old and lack modern requisites for a center of this size. The Municipality has under construction a new hospital which, when finished, will contain all departments and will be a very modern and creditable institution of about seven hundred beds. It is ideally located on the outskirts of the city in a suburb well named Miraflores, which might be translated "A Vision of Flowers," the flowers of course in this latitude being in bloom throughout the year. At present this hospital has in general use about two hundred beds and a separate contagious disease department of ample capacity.

7. *Typhus Epidemic*

There had been an outbreak of typhus in and around LaPaz shortly before my arrival and I

had an opportunity to see a number of cases of this interesting disease in various stages of its progress, from the early eruption to the point of convalescence, this being my first experience with the disease which is fortunately rare in our country.

A young American surgeon of great promise, Dr. Charles Eastman, in charge of the hospital at the tin mining operations of a large American corporation, was one of the victims of this recent epidemic. As is well known, the disease is transmitted by the bite of a louse, and Dr. Eastman, in his zeal for the care of his patients and reckless of his own welfare (as Mr. Graham, the general manager of the company, told me), in order that he might better care for the Indian victims of the disease and also from a strong scientific interest in the study of the malady, often slept in the native huts which were located in remote places, exposing himself to infection without thought of himself. He is looked upon by the men who were familiar with him and with his work as a martyr to the cause of science. We have reason to be proud of the record of this fellow countryman of ours in a far land.

8. National Hygienic Laboratory—Dr. Nestor Morales

The National Hygienic Laboratory of Bolivia is located at LaPaz. Its location is adjacent to the Miraflores Hospital. Under the directorship of Dr. Nestor Morales this institution has gained an enviable reputation in all of that part of South America. The various sera and vaccines which are recognized by the profession as of value in treatment and diagnosis are prepared in an excellent manner and under thorough scientific supervision in a Government laboratory, whence they are distributed.

The lack of adequate hospital facilities in Bolivia as elsewhere has been due in a large part to absence of a definite governmental policy with regard to scientific matters. As in our own country, political interference with the personnel of hospital staffs and of university faculties delays progress.

The surgeons of Bolivia have the right spirit; they have vision and ambition for the best things in scientific progress; the leading men are all young and active, they have been trained abroad, and they are cognizant of the best things in scientific progress outside of the boundaries of their own country. Under their leadership Bolivia is undoubtedly at the beginning of great accomplishments. As in Ecuador, a number of them expressed their intention of accepting the invitation to attend the next Clinical Congress to be held in Philadelphia in October of this year. The value of this affiliation and its far-reaching influence will be more evident as time goes on.

IV. Retrospect

I look back upon my visit to Ecuador and Bolivia with great pleasure. The press and that portion of the public with whom I came in contact treated my mission as something of real importance. The newspapers in both countries attached enough significance to it to make it a matter of front-page publicity and the profession received our invitation with enthusiasm. There was the feeling of having received a genuine and cordial welcome, and I have remembrances of hours well spent in the company of courteous, warm-hearted professional colleagues. The welcome was, of course, in no sense a personal one, but a quick and hearty recognition of the hand of professional brotherhood extended to the surgeons of Ecuador and Bolivia by the surgeons of the United States and Canada. It is the beginning of a relationship which will endure to the mutual benefit of all and to the advancement of the Art.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

ELEVENTH ANNUAL SESSION, PHILADELPHIA, OCTOBER 24–28, 1921

GEORGE E. ARMSTRONG, Montreal, *President*
JOHN B. DEAVER, Philadelphia, *President-Elect* ALBERT J. OCHSNER, Chicago, *Treasurer*
FRANKLIN H. MARTIN, Chicago, *Secretary-General*

PRELIMINARY CLINICAL PROGRAM FOR PHILADELPHIA MEETING

IN the following pages is presented a preliminary schedule of clinics and demonstrations to be given by the clinicians of Philadelphia during the eleventh annual session to be held in that city October 24 to 28, 1921. The published schedule, it will be understood, is a tentative one, and is to be amplified and corrected from month to month as the work of the Committee on Arrangements progresses, so that the final program will fully represent the clinical activities of that great medical center, providing a complete showing of Philadelphia's facilities in every department of surgery, including gynecology, obstetrics, orthopedics, urology, surgery of the eye, ear, nose, throat, and mouth, experimental surgery, surgical pathology, roentgenology, etc. The real program of the Congress, however, is that to be bulletined each afternoon at headquarters, which will present an accurate and detailed list of the operative clinics and demonstrations to be given in the several hospitals and medical schools on the succeeding day.

The general plan of previous sessions will be followed at the Philadelphia meeting—operative clinics and demonstrations in the hospitals and medical schools will occupy the morning and afternoon hours of the four days, Tuesday to Friday inclusive, with scientific meetings each evening in the ballroom ot the Bellevue-Stratford.

The Congress formally opens with the Presidential Meeting on Monday evening, at which meeting the John B. Murphy Oration in Surgery will be delivered by Dr. William J. Mayo of Rochester. The Executive Committee of the Congress, in preparing the program of papers to be read and discussed at the evening sessions, has invited a number of eminent European surgeons to read papers. Acceptances have been received from the following: Sir Harold J. Stiles, Edinburgh, Scotland; Professor H. C. Jacobaeus, Stockholm, Sweden; Professor J. Schoemaker, The Hague, Holland; Professor F. de Quervain, Berne, Switzerland, and Sir William Taylor, Dublin, Ireland.

General headquarters for the Congress will be at the Bellevue-Stratford Hotel where the entire first floor has been reserved for the use of the Congress. The large ballroom will be utilized for the evening sessions, certain clinical demonstrations, business meetings, etc, while the Clover, Red, Green, and other large rooms and foyers on the same floor will provide ample space for registration and ticket bureaus, bulletin rooms, etc. Headquarters will be open for registration at noon, Monday, October 24th. The clinical program for Tuesday will be bulletined at headquarters that afternoon, and tickets for Tuesday's clinics will be issued as visiting surgeons register.

The ninth annual convocation of the American College of Surgeons will be held in the ballroom on Friday evening at 8 o'clock, at which time fellowship in the College will be conferred upon a large group of American and Canadian surgeons, and honorary fellowship upon the distinguished foreign guests.

The annual business meeting of the American College of Surgeons and the Clinical Congress will be held on Thursday afternoon.

REDUCED RAILWAY FARES

The railways of the United States have, with but few exceptions, granted reduced rates for the Philadelphia meeting, and it is expected that the Canadian railways will join in the arrangement. The plan provides for the sale of round-

trip tickets at one and one-half the ordinary one-way fare. These tickets will be sold to members upon presentation of identification certificates issued from the office of the Secretary-General. Further detailed information with regard to fares and traffic arrangements will be published in the next issue of this journal.

LIMITED ATTENDANCE — ADVANCE REGISTRATION

Because of the popularity of these annual clinical meetings it has been found necessary in recent years to adopt the plan of limiting the attendance, requiring registration in advance on the part of those who wish to attend. A survey of the amphitheaters, lecture rooms, and laboratories in the several hospitals and medical schools, as to their capacity for accommodating visitors, has been made and the limit of attendance based thereon.

CLINIC TICKETS

Attendance at all clinics and demonstrations is controlled by means of special clinic tickets, the number of tickets issued for any clinic or demonstration being limited to the capacity of the room in which the clinic or demonstration is to be given.

Clinic tickets will be issued at headquarters each morning at 8 o'clock for the clinics and demonstrations to be given that day, except that for Tuesday's clinics the tickets will be issued on Monday afternoon as the visiting surgeons register. Each afternoon a complete schedule of the following day's clinics will be posted on bulletin boards at headquarters. After the program has been posted, reservations for tickets for the clinics may be filed, the tickets to be issued the following morning. Printed programs will be issued each morning containing the complete clinical program for the day with announcements of the evening sessions, business meetings, etc.

REGISTRATION FEE

A registration fee of $5.00 is required of each surgeon attending the annual clinical meeting, the receipts from registration fees providing the funds with which to meet the expenses of conducting the meeting, so that no financial burden is imposed upon the members of the profession in the city entertaining the Congress.

A formal receipt for the registration fee is issued to each surgeon registering in advance, which receipt is to be exchanged for a general admission card at headquarters upon his arrival in Philadelphia. This card, which is non-transferable, must be presented to secure clinic tickets and admission to the evening meetings.

PRELIMINARY CLINICAL PROGRAM

POLYCLINIC HOSPITAL

Tuesday, October 25

DEFOREST WILLARD—10. Orthopedics.
E. A. CASE—11. Surgical pathology.
G. M. PIERSOL and DR. BACHUS—12. Gastro-enterology.
GEORGE B. WOOD—2. Nose and throat.
T. WEISENBERG—2. Neurology.
J. F. SCHAMBERG—3. Salvarsan clinic.

Wednesday, October 26

J. K. YOUNG—10. Orthopedics.
MISS H. E. KIRCH—11. Social service.
J. A. KOLMER and J. K. YOUNG—2. Demonstrations of research work in connection with the manufacture of salvarsan.
RALPH BUTLER—2. Nose and throat.

Thursday, October 27

E. A. CASE—9. Surgical pathology.
MRS. M. S. STEEL—10. Speech clinic.
WALTER ELMER—11. Orthopedics.
B. A. THOMAS—2. Genito-urinary surgery.
GEORGE B. WOOD—2. Nose and throat.

Friday, October 28

J. K. YOUNG and DEFOREST WILLARD—10. Orthopedics.
RALPH BUTLER—2. Nose and throat.
J. C. GITTINGS—2. Pediatrics.

LANKENAU HOSPITAL

Tuesday, October 25

A. G. MILLER and ROBERT SHOEMAKER—10. X-Ray clinic for fractures and joint injuries.

Wednesday, October 26

JOHN B. DEAVER, GEORGE G. ROSS, and A. D. WHITING—9. General surgery.

Thursday, October 27

JOHN B. DEAVER, GEORGE G. ROSS, and A. D. WHITING—9. General surgery.

Friday, October 28

A. G. MILLER and ROBERT SHOEMAKER—10. Fractures and joint injuries.

ORTHOPEDIC HOSPITAL

Tuesday, October 25

A. P. C. ASHHURST and EDWARD T. CROSSAN—3. Demonstrations: tarsectomy for rigid flat foot, inveterate club foot, and equinocavus; birth injuries of shoulders; lacerations of brachial plexus.

Thursday, October 27

A. BRUCE GILL—10. Orthopedics.

Friday, October 28

WILLIAM J. TAYLOR—10. Orthopedics.

PENNSYLVANIA HOSPITAL

Tuesday, October 25

W. D. STROUD—10. Electrocardiogram.
DR. MACMILLAN—10. Basal metabolism.
D. R. BOWEN—10. Roentgenology.
DR. NEWCOMER—10. Surgical pathology.
DRS. LECONTE, LEE, and BROWN—11. General surgery.
L. J. HERMAN—1. Genito-urinary surgery.
E. A. STRECKER—1. Neurology.
DRS. PACKARD, EVES, and DAVIES—2. Ear, nose, and throat.
DRS. SHOEMAKER and CRAMPTON—2. Eye clinic.

Wednesday, October 26

W. D. STROUD—10. Electrocardiogram.
DR. MACMILLAN—10. Basal metabolism.
D. R. BOWEN—10. Roentgenology.
DR. NEWCOMER—10. Surgical pathology.
G. W. NORRIS—10. Medical clinic.
DRS. GIBBON, BILLINGS, and KLOPP—11. General surgery.
DRS. SHOEMAKER and CRAMPTON—2. Eye clinic.
DRS. PACKARD, EVES, and DAVIES—2. Ear, nose, and throat.
F. C. KNOWLES—2. Skin.

Thursday, October 27

W. D. STROUD—10. Electrocardiogram.
DR. MACMILLAN—10. Basal metabolism.
D. R. BOWEN—10. Roentgenology.
DR. NEWCOMER—10. Surgical pathology.
A. NEWLIN—10. Medical clinic.
DRS. MITCHELL, LEE, and BROWN—11. General surgery.
L. J. HERMAN—1. Genito-urinary surgery.
DRS. NEWCOMER, DAVIS, and KNOWLES—2. Syphilis-Salvarsan.
E. A. STRECKER—2. Neurology.
DRS. SHOEMAKER and CRAMPTON—2. Eye clinic.
DRS. PACKARD, EVES, and DAVIES—2. Ear, nose, and throat.

Friday, October 28

W. D. STROUD—10. Electrocardiogram.
DR. MACMILLAN—10. Basal metabolism.
D. R. BOWEN—10. Roentgenology.
DR. NEWCOMER—10. Surgical pathology.
T. MCCRAE—10. Medical clinic.
DRS. GIBBON, BILLINGS, and KLOPP—11. General surgery.
DRS. PACKARD, EVES, and DAVIES—2. Ear, nose, and throat.
DRS. SHOEMAKER and CRAMPTON—2. Eye clinic.

METHODIST HOSPITAL

Tuesday, October 25

WILLIAM R. NICHOLSON—9. Gynecology.
J. H. BALDWIN—11. General surgery.
WALTER ROBERTS—1. Nose and throat.
PHILIP H. MOORE—2. Eye clinic.
M. F. PERCIVAL—3. Roentgenology.

Wednesday, October 26

G. G. ROSS—9. General surgery.

Thursday, October 27

RICHARD NORRIS—2. Gynecology and obstetrics.

Friday, October 2

J. L. HERMAN—12. Genito-urinary surgery.
L. J. HAMMOND—2. General surgery.
J. T. RUGH—3. Orthopedics.

UNIVERSITY HOSPITAL

Tuesday, October 25

B. C. HIRST and J. C. HIRST, II—9. Gynecology and obstetrics.
C. C. NORRIS and F. E. KEENE—9. Gynecology.
GEORGE ROSS—9. Hernia clinic.
ALFRED STENGEL and staff—12. Medical cases with surgical aspects.

Wednesday, October 26

CHARLES H. FRAZIER and FRANCIS GRANT—9. Operations and demonstrations; surgery of nervous system.
F. E. KEENE and C. C. NORRIS—9. Gynecology.
D. B. PFEIFFER—9. General surgery.
THOMAS NEILSON and ALEX RANDALL—11. Urology.
HENRY PANCOAST—3. Roentgenological demonstrations.

Thursday, October 27

B. C. HIRST, E. B. PIPER, and J. C. HIRST, II—9. Gynecological and obstetrical operations and demonstrations.
GEORGE P. MULLER—9. Surgery of the chest.
C. C. NORRIS and F. E. KEENE—9. Gynecology.
C. H. FRAZIER and FRANCIS GRANT—9:30. Neurological surgery, operations and demonstrations.

Friday, October 28

F. E. KEENE and C. C. NORRIS—9. Gynecology.
C. H. FRAZIER and FRANCIS GRANT—9:30. Neurological surgery, operations and demonstrations.
JOHN B. DEAVER—10. General surgery, operations.
CHARLES P. GRAYSON—2. Nose and throat.
HENRY PANCOAST—3. Roentgenological demonstrations.

HOWARD HOSPITAL

Tuesday, October 25

A. C. WOOD—9. General surgery.
E. L. ELIASON—11. General surgery.
GEORGE B. WOOD—1. Nose and throat.
R. J. HUNTER and S. COHEN—2. Nose and throat operations (tonsillectomy).

Wednesday, October 26

BERNARD MANN—9. Gynecology.
BARTON COOKE HIRST—11. Gynecology.
W. C. POSEY—2. Eye clinic.

Thursday, October 27

A. C. WOOD—9. General surgery.
E. L. ELIASON—11. General surgery.
GEORGE B. WOOD—2. Nose and throat.

Friday, October 28

BERNARD MANN—9. Gynecology.
BARTON COOKE HIRST—11. Gynecology.
W. C. POSEY—2. Eye clinic.

CHILDREN'S HOSPITAL, MARY J. DREXEL HOME

Tuesday, October 25

N. L. KNIPE—2. Eye operations.

Wednesday, October 26

RALPH BUTLER—2. Mastoid operations.

Thursday, October 27

JAMES A. BABBITT—2. Tonsil and adenoid operations.

Friday, October 29

H. C. DEAVER and E. G. ALEXANDER—10:30. General surgery.

MEDICO-CHIRURGICAL HOSPITAL

Tuesday, October 25

GEORGE P. MULLER—9. General surgery.
JOHN A. KOLMER. Demonstration—frozen section work.
GEORGE COATES and MATTHEW ERSNER. Demonstration—nose and throat cases.
W. H. MACKINNEY—10. Genito-urinary surgery.
GEORGE COATES and MATTHEW ERSNER—2. Nose and throat.
I. S. RAVDIN—3. Demonstration—postoperative cases of compound fractures.
J. F. JAFFEE—3:30. Gynecological models.
T. T. THOMAS—4. Demonstration—operation for recurrent dislocation of shoulder.

Wednesday, October 26

J. H. JOPSON—9. General surgery.
W. R. NICHOLSON—9. Gynecology.
L. WEBSTER FOX—2. Eye clinic.
R. H. SKILLERN—2. Sinus clinic.
T. T. THOMAS—3. Recurrent dislocation of shoulder.
WILLIAM BATES—4. Demonstration of fractures.

Thursday, October 27

E. LAPLACE—9. Surgical clinic and demonstrations.
R. F. RIDPATH—10. Demonstration of sinus cases.
G. E. PFAHLER—2. Electro-coagulation clinic with demonstration of cases.
MORRIS B. MILLER—3. Demonstration of cases of cervical adenitis treated with tuberculin.

Friday, October 28

J. B. CARNETT—9. General surgery.
G. M. BOYD—9. Gynecology.
GEORGE COATES, M. ERSNER, R. H. SKILLERN, and R. F. RIDPATH—2. Tonsillectomies.
H. MCKNIGHT—2. Demonstration of interesting fractures.

JEFFERSON HOSPITAL

(Days and hours to be announced)

J. CHALMERS DACOSTA. General surgery.
JOHN H. GIBBON. General surgery.
S. MACCUEN SMITH. Ear, nose, and throat.
BROOKE M. ANSPACH. Gynecology.
CHEVALIER JACKSON. Laryngology.
E. P. DAVIS. Gynecology.
WILLIS F. MANGES. Roentgenology.
J. TORRANCE RUGH. Orthopedics.
H. F. HANSELL. Eye clinic.
H. R. LOUX. Genito-urinary surgery.

STETSON HOSPITAL

Tuesday, October 25

B. M. ANSPACH—8. Gynecology.
W. K. NEELY—9. Obstetrics.

Wednesday, October 26

S. E. TRACY—9. Gynecology.
CARL LEE FELT—1. Laryngology.

Thursday, October 27

J. A. BOGER and W. ELLIS—8. General surgery.
W. K. NEELY—9. Obstetrics.

Friday, October 28

S. E. TRACY—9. Gynecology.
CARL LEE FELT—1. Laryngology.

PROTESTANT EPISCOPAL HOSPITAL

Tuesday, October 25

A. P. C. ASHHURST and I. M. BOYKIN—9. General surgery.
LOUIS H. MUTSCHLER—11. General surgery.
G. ORAM RING—3. Eye operations.

Wednesday, October 26

A. BRUCE GILL—9. Orthopedic operations.
H. G. GOLDBERG—2. Eye operations—cataract.
J. P. GALLAGHER and E. COLLINS—3. Ear, nose, and throat (ethmoid).

Thursday, October 27

H. C. DEAVER and E. G. ALEXANDER—10. General surgery.
T. R. NEILSON—11. General surgery.
CHARLES C. BIEDERT and T. R. CURRIE—2. Ear, nose, and throat operations.

Friday, October 28

A. P. C. ASHHURST and EDWARD T. CROSSAN—9. General surgery.
A. P. C. ASHHURST and RALPH S. BROMER—2. Dry bone clinic (cystic disease and sarcoma).

ST. AGNES' HOSPITAL

G. M. DORRANCE and LOWRAIN E. MCCRAE—Plastic operations on the face and neck. Cases showing the results of operations.
J. W. BRANSFIELD—Treatment of burns by the use of acetic acid method.
E. C. MURPHY—Application of Whitman's cast.
JOHN F. X. JONES and W. J. RYAN—Demonstrations of fractures and hernias.
J. C. HIRST—Prolapse of the uterus.
BENJAMIN D. PARRISH—Demonstration of sinus cases with tonsillectomy by the LaForce method, local and general anæsthesia; demonstration of mastoid cases with indications for each.
J. P. MANN—Demonstration of cases with operation for diseases of the hip joint.
ALFRED HEINEBERG—Uterine endoscopy.
JOHN M. FISHER—Repair of pelvic floor; amputation of cervix; hysterectomy for fibroids of the uterus; hysterectomy for carcinoma of the uterus; operative correction for displacements of the uterus; operations in cases of pelvic inflammatory diseases.

PHILADELPHIA GENERAL HOSPITAL

Tuesday, October 25

H. R. LOUX—9. General surgery.
J. T. RUGH—2. Orthopedics.
M. M. FRANKLIN—3:30. Orthopedics.

Wednesday, October 26

T. T. THOMAS—9. General surgery.
F. O. LEWIS—3:30. Laryngology.

Thursday, October 27

JOHN FISHER—9. Gynecology.
J. C. HIRST—10:30. Gynecology.

Friday, October 28

H. R. OWEN—9. General surgery.
E. R. KIRBY—2. Genito-urinary surgery.
R. H. IVY—3:30. Oral surgery.

MISERICORDIA HOSPITAL

Tuesday, October 25

JAMES A. KELLY and E. LAPLACE—9. General surgery, operative clinic.
CORNELIUS MCCARTHY—2. Nose and throat.

Wednesday, October 26

J. F. X. JONES—9. General surgery, operative clinic.
GEORGE P. MULLER—9. Genera. surgery, operative clinic.
THOMAS F. BYRNE—2. Nose and throat.

Thursday, October 27

JAMES A. KELLY—9. General surgery, operative clinic.
ERNEST LAPLACE—9. General surgery, operative clinic.

Friday, October 28

J. F. X. JONES—9. General surgery, operative clinic.
GEORGE P. MULLER—9. General surgery, operative clinic.
LOUIS LOVE—2. Ophthalmology.

KENSINGTON HOSPITAL FOR WOMEN

Tuesday, October 25

E. G. ALEXANDER—11. Gynecology.

Wednesday, October 26

H. C. DEAVER—11. Gynecology.

Thursday, October 27

DANIEL LONGAKER—11. Obstetrics.

Friday, October 28

W. E. PARKE—11. Gynecology.

ST. CHRISTOPHER'S HOSPITAL

Tuesday, October 25

R. R. WILLOUGHBY—10:30. Tonsil and adenoid operations.

Wednesday, October 26

E. G. ALEXANDER—10:30. General surgery.
ROBERT GRAY—1. Orthopedic operations.

Thursday, October 27

DR. ADAMS—10:30. Operative eye clinic.
FREDERICK KRAUSS—2:30. Mastoid clinic.

Friday, October 28

C. A. CURRIE—10:30. Tonsil and adenoid operations.

WOMEN'S HOSPITAL

Tuesday, October 25

MARIE K. FORMAD—9. Gynecology.
SARAH H. LOCKREY—11. Gynecology.
LIDA STEWART COGILL—2. Obstetrics.
LAURA EMMA HUNT—2. Throat, nose, and ear.

Wednesday, October 26

KATE W. BALDWIN—8:30. General surgery.
CAROLINE PURNELL—11. Gynecology.
MARGARET WARLOW—2. Nose, throat, and ear.
MARY GETTY—3. Eye clinic.
MARY BUCHANAN—4. Eye clinic.

Thursday, October 27

CATHARINE MACFARLANE—9:30. Gynecology.
MARY THOMAS MILLER—11. Obstetrics.

Friday, October 28

ANN TOMKINS GIBSON—9. Obstetrics.
ELLA WILLIAMS GRIM—11. Obstetrics.
MIRIAM BUTT—3. Eye clinic.

PRESBYTERIAN HOSPITAL

Tuesday, October 25

J. H. JOPSON and D. B. PFEIFFER—9. General surgery.
J. H. GIRVIN—1. Gynecology.
A. B. GILL—3. Orthopedics.

Wednesday, October 26

G. E. SHOEMAKER—9. Gynecology.
B. A. THOMAS—2. Urology.

Thursday, October 2

JOHN SPEESE, J. S. RODMAN, and H. P. BROWN—9. General surgery.

Friday, October 28

J. H. JOPSON—9. General surgery.
N. P. STAUFFER—2. Nose and throat.

ST. JOSEPH'S HOSPITAL

Tuesday, October 25

JOSEPH M. SPELLISY—10. Orthopedics.
JOHN F. X. JONES—11. General surgery.
E. E. MONTGOMERY, F. HURST MAIER, and P. BROOKE BLAND—1. Gynecology.
GEORGE E. MORLEY MARSHALL and WILLIAM E. QUICKSALL—1. Otology and laryngology.
PAUL J. PONTIUS, CHARLES J. JONES, and T. A. O'BRIEN—1. Ophthalmology.

Wednesday, October 26

JAMES A. KELLY—9. General surgery.
E. E. MONTGOMERY, F. HURST MAIER, and P. BROOKE BLAND—1. Gynecology.
PAUL J. PONTIUS, CHARLES J. JONES, and T. A. O'BRIEN—1. Ophthalmology.
GEORGE E. MORLEY MARSHALL and WILLIAM E. QUICKSALL—1. Otology and laryngology.

Thursday, October 27

MELVIN M. FRANKLIN—9. General surgery.

Friday, October 28

CHARLES F. NASSAU—9. General surgery.
E. E. MONTGOMERY, F. HURST MAIER, and P. BROOKE BLAND—1. Gynecology.
GEORGE E. MORLEY MARSHALL and WILLIAM E. QUICKSALL—1. Otology and laryngology.
PAUL J. PONTIUS, CHARLES J. JONES, and T. A. O'BRIEN—1. Ophthalmology.

SAMARITAN HOSPITAL

Tuesday, October 25

W. WAYNE BABCOCK—9. General surgery.
WILMER KRUSEN—12. Gynecology.
LUTHER PETER—2. Ophthalmology.
HARRY HUDSON—3. Orthopedics.
G. C. BIRD—4. X-Ray demonstrations.

Wednesday, October 26

J. C. APPLEGATE—11. Obstetrics.
FRANK HAMMOND—12. Gynecology.
WILLIAM A. STEELE—2. General surgery.
COLLIER MARTIN—3. Rectal surgery.

Thursday, October 27

W. WAYNE BABCOCK—9. General surgery.

Friday, October 28

J. O. ARNOLD—12. Obstetrics.
WILLIAM A. HITSCHLER—3. Ear, nose and throat.
HERSHEY THOMAS—3. Genito-urinary surgery.

MOUNT SINAI HOSPITAL

Tuesday, October 25

J. C. HIRST—9. Gynecology.
GEORGE ROSENBAUM—11. X-Ray demonstrations.
A. WATSON—2. Nose and throat operations.
C. W. LEFEVER—4. Eye operations.

Wednesday, October 26

M. BEHREND—9. General surgery.
L. FISHER—2. Nose and throat operations.
A. I. RUBENSTONE—2. Surgical pathology and blood transfusion.
C. S. HIRSCH—4. Genito-urinary surgery.

Thursday, October 27

L. BRINKMAN—9. Gynecology.
GEORGE ROSENBAUM—11. X-Ray demonstrations.

Friday, October 28

J. C. HIRST—9. Gynecology.
M. BEHREND—11. General surgery.
L. FISHER—2. Nose and throat operations.
S. J. GITTELSON—3. Eye operations.
A. I. RUBENSTONE—4. Surgical pathology and blood transfusion.

JEWISH HOSPITAL

Tuesday, October 25

W. H. TELLER—9. General surgery.
E. STEINFIELD—10. Serology and bacteriology.
H. M. GODDARD—2. Rhinology.
S. L. FELDSTEIN—2. Roentgenology.
C. S. HIRSCH—2. Urology.

Wednesday, October 26

F. B. BLOCK—9. Pelvic surgery.
A. REISS—12. Electrotherapy.
S. F. FELDSTEIN.—2. Roentgenology.
C. STAMM—2. Obstetrics.
A. W. WATSON—3. Rhinology.

Thursday, October 27

M. BEHREND—9. General surgery.
E. STEINFIELD—10. Serology and bacteriology.

Friday, October 28

L. BRINKMAN—9. General surgery.
S. L. FELDSTEIN—2. Roentgenology.
G. W. SHOLLER—2:30. Gynecology.
C. S. HIRSCH—4. Cystoscopy and urology.

WOMEN'S HOMEOPATHIC HOSPITAL

Tuesday, October 25

DRS. W. E. STRONG, ROCHESTER, and HARTLEY—10. General surgery.
J. A. BROOKE—1. Obstetrics.

Wednesday, October 25

L. T. ASHCRAFT—10. Urology.
W. C. BARKER—1. Roentgenology.

Thursday, October 27

DRS. PALEN, CLAY, and CRISWELL—10. Eye, ear, nose, and throat.

Friday, October 28

DRS. CALEY, HUGHES, and D. B. JAMES, JR.—10. Gynecology.
DRS. BROOKE and LARER—1. Orthopedics.

HAHNEMANN HOSPITAL

Tuesday, October 25

H. L. NORTHROP—9. General surgery.
N. F. LANE and W. D. CULIN—9. Gynecology.
W. W. SPEAKMAN and F. O. NAGLE—2. Eye clinic.
W. G. SCHMIDT—2. Hydrogen-ion concentration.
J. S. HEPBURN—3:30. Blood chemistry.

Wednesday, October 26

G. A. VAN LENNEP—9. General surgery.
J. E. JAMES, JR.—9. Prenatal care.
G. J. PALEN and J. V. F. CLAY—2. Ear clinic.
J. D. ELLIOIT—2. Surgical pathology.
S. W. SAPPINGTON—3:30. Basal metabolism.

Thursday, October 27

H. P. LEOPOLD—9. General surgery.
D. B. JAMES—9. Gynecology.

Friday, October 28

L. T. ASHCRAFT—9. Urology.
W. C. MERCER—9. Obstetrics.
F. W. SMITH—2. Bronchoscopy and tracheoscopy.
OSCAR SEELEY—2. Œsophagoscopy.

WOMEN'S MEDICAL COLLEGE

Tuesday, October 25

E. G. ALEXANDER—11. General surgery.
MARGARET F. BUTLER—2. Rhinology and laryngology.

Wednesday, October 26

ELLA B. EVERITT—9. Gynecology.
MARY BUCHANAN—3. Ophthalmology.

Thursday, October 27

ELLA B. EVERITT—9. Gynecology.

Friday, October 28

HARRY C. DEAVER—11. General surgery.

ST. LUKE'S HOSPITAL

Tuesday, October 25

DESIDERIO ROMAN—9. General surgery.
O. F. BARTHMAIER and J. W. POST—2. Group study of the thyroid: laboratory, roentgenology, surgery.

Friday, October 28

DESIDERIO ROMAN—9. General surgery.
I. G. SHALLCROSS—11. Eye clinic.
J. W. POST—2. Roentgenological study of chronic arthritis as a basis for differential diagnosis and etiology.

CHILDREN'S HOMEOPATHIC HOSPITAL

Tuesday, October 25

H. P. LEOPOLD—11. General surgery.

Wednesday, October 26

BAYARD KNERR—11. Nose and throat.
F. W. SMITH, OSCAR SEELEY, and O. F. BARTHMAIER—2. Pathological studies.

Thursday, October 27

JOHN A. BROOKE—1. Orthopedics.

STATE CLINICAL MEETINGS HELD IN JUNE

NORTH DAKOTA—BISMARCK

FRIDAY, JUNE 24

Clinics

At the Bismarck and St. Alexius Hospitals, 8 a.m. to 12 m.

Hospital Conference, 2 p.m.

Eric P. Quain, M.D., Chairman, North Dakota Section, presiding.
Summary of Work in Hospital Standardization by the American College of Surgeons—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.
The Soul of Hospital Standardization—Reverend C. B. Moulinier, S.J., President, Catholic Hospital Association.
The Surveyor's Work in the Standardization of Hospitals—Thaddeus E. Allen of the American College of Surgeons.
Experience with the Standardization Program of the American College of Surgeons, from the Surgeon's Standpoint—J. O. Arnson, M.D., Bismarck.
Experience with the Standardization Program of the American College of Surgeons, from the Hospital Superintendent's Standpoint—A. O. Fonkalsrud, Ph. D., Superintendent, St. Luke's Hospital, Fargo.
Discussion—Opened by R. D. Campbell, M.D., Grand Forks; continued by A. J. McCannel, M.D., Minot.
General Discussion.

Public Meeting, 8 p.m.

Eric P. Quain, M.D., Chairman, North Dakota Section, presiding.
Address of Welcome—Judge A. M. Christianson, North Dakota Supreme Court.
The American College of Surgeons—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.
The Woman of Slender, Frail Physique. How May We Solve This Problem?—Richard R. Smith, M. D., Grand Rapids, Mich.
Cancer of the Breast: Its Early Recognition and Treatment—Jabez N. Jackson, M.D., Kansas City, Mo.
The Surgeon and the Public—A. T. Mann, M.D., Associate Professor of Surgery, University of Minnesota Medical School, Minneapolis, Minn.
The Community's Interest in Hospitals—Reverend C. B. Moulinier, S. J., President, Catholic Hospital Association.

SATURDAY, JUNE 25

Clinics

At the Bismarck and St. Alexius Hospitals, 8 a.m. to 12 m.

Scientific Session, 2 p.m.

Eric P. Quain, M.D., Chairman, North Dakota Section, presiding.
The Care of the Surgical Case Before It is Attended by the Surgeon—J. W. Bowen, M.D., Dickinson.
Hernia: Methods for Difficult Cases—A. T. Mann, M.D., Minneapolis, Minn.
Direct Laryngoscopy, Bronchoscopy, and Œsophagoscopy, with Report of Cases—Archibald D. McCannel, M.D., Minot.
Cystocele and Urethrocele and Their Surgical Treatment—Richard R. Smith, M.D., Grand Rapids, Mich.
Chronic Cholecystitis—R. E. Weible, M.D., Fargo.
The Comparative Anatomy of the Fundus Oculi—J. H. Rindlaub, M.D., Fargo.
Technique of the Proper Operation for Cancer of the Breast—Jabez N. Jackson, M.D., Kansas City, Mo.

SOUTH DAKOT—ABERDEEN

MONDAY, JUNE 27

Clinics

At the Lincoln and St. Luke's Hospitals, 8 a.m. to 12 m.

Hospital Conference, 2 p.m.

Robert D. Alway, M.D., Chairman, South Dakota Section, presiding.
Summary of Work in Hospital Standardization by the American College of Surgeons—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.
The Soul of Hospital Standardization—Reverend C. B. Moulinier, S.J., President, Catholic Hospital Association.
The Surveyor's Work in the Standardization of Hospitals—Thaddeus E. Allen of the American College of Surgeons.
Experience with the Standardization Program of the American College of Surgeons, from the Surgeon's Standpoint—Gilbert Geoffrey Cottam, M.D., Sioux Falls.
Discussion—Opened by Frederick A. Spafford, M.D., Flandreau.
General Discussion.

Public Meeting, 8 p.m.

The American College of Surgeons—Franklin H. Martin, M.D., Secretary-General, American College of Surgeons.
The Woman of Slender, Frail Physique. How May We Solve This Problem?—Richard R. Smith, M.D., Grand Rapids, Mich.
Cancer of the Breast; Its Early Recognition and Treatment—Jabez N. Jackson, M.D., Kansas City, Mo.
The Surgeon and the Public—A. T. Mann, M.D., Associate Professor of Surgery, University of Minnesota Medical School, Minneapolis, Minn.
The Community's Interest in Hospitals—Reverend C. B. Moulinier, S.J., President, Catholic Hospital Association.

TUESDAY, JUNE 28

Clinics

At the Lincoln and St. Luke's Hospitals, 8 a.m. to 12 m.

Scientific Session, 2 p.m.

The Reparative Surgery of Post-Traumatic Bone Defects—Gilbert Geoffrey Cottam, M.D., Sioux Falls.
Hernia: Methods for Difficult Cases—A. T. Mann, M.D., Minneapolis, Minn.
Cystocele and Urethrocele and Their Surgical Treatment—Richard R. Smith, M.D., Grand Rapids, Mich.
Osteomyelitis—F. W. Minty, M.D., Rapid City.
Technique of the Proper Operation for Cancer of the Breast—Jabez N. Jackson, M. D., Kansas City, Mo.